..THE IRON AGE..

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New Products Offset Depression

TO bring even a semblance of order and production success out of the present industrial situation is an accomplishment for any manufacturer. Additional credit, however, must go to such companies as the Scovill Mfg. Co., which with great wartime expanded plants in operation in 1929 nevertheless has been able to make adjustments to meet the drastic 1930-31 changes in demand. Drawing upon its experience during the difficult years after the war, the Scovill company has developed new products and new means of distribution and has revolutionized its plant overhead structure. The accompanying article describes some of the features which have helped this company in its adjustment program. The story is one of a manufacturing spirit which refused to be downed.

By JOHN H. GOSS

Vice-President and General Superintendent
Scovill Mfg. Co., Hartford, Conn.

SCOVILL MFG. CO., Waterbury, Conn., made munitions during the war, employing at the peak of its wartime production close to 16,000 men in a plant which had been hurriedly enlarged to several times its original size. After the war the company was faced with the serious readjustment problems common to all large munitions manufacturing plants.

This company came through the war experience with large cash reserves, and while, with these reserves in hand and its established line of wartime manufacture completely cut off, there was a temptation for those in control to divide those reserves liberally among the stockholders, this was not overdone. One of the chief reasons for keeping these reserves large was the probable large cost of plant rehabilitation to peacetime requirements. Another reason was a feeling that in some way the costs of wartime production had not been fully liquidated either for the stockholders or the employees.

To save jobs for as many employees as possible at the abrupt ending of the war, the company went out and took any kind of business which it could produce at most any price for which it could be secured. The result for a period of time was an operating loss, but it meant saving the organization and furnishing employment to many employees who would otherwise have been out of work. This led to a less severe and more orderly readjustment of the plant and of the employees to peacetime operations.

After War Adjustments

LATER, the going businesses of outside peacetime manufacturing concerns were bought, their existing managements being left in charge. This had the effect of broadening the diversity of product, of furnishing tonnage to the company's rolling mills, wire mills and tube mills without sales cost and did not involve capital expenditure in the development and installation of new and added productive facilities, which expenditure would have contributed to the development of a national over-capacity in that direction.

Neither did this program make a contribution to the increasingly serious competitive situation arising from an over-supply of productive facilities, nor did it disturb any of the communities in which these businesses were located, because they were not moved, and therefore continued to furnish employment for and pay taxes to those communities. It had also the effect of adding new products and furnishing new outlets and new contacts. This all called for an active use of the large cash reserves retained by the management in the company's treasury and justified their judgment in having built it up.

However, all this was but a start. To continue as a successful and an enduring company, sound principles of manufacturing and merchandising had to be effected. One of the chief obstacles was found in the inefficient manufacturing habits engendered by the war experience with its insistent demand for greater and greater production regardless of cost. Important adjustments had to be made by the

workers themselves, who had built up a standard of living during the wartime frenzy far above that possible under peacetime hours and wages.

These various adjustments, involving new methods, were gradually developed, and thus new economies effected. The business of the company increased over a period of years until the depression of 1930 arrived, when new adjustments almost as drastic as those after the war had to be made.

New Products and New Outlets

CALLING upon the wartime experience as a precedent, the company again looked for new products, new outlets and greater economies in production. Men were sent out to study trends in the public buying. Chain stores were seen to be active and new novelties and small products for outlet through the chain stores were created. As a case in point in the study of styles and trends, reports indicated that women throughout the country wanted more and more elaborate toilet articles, such as vanity cases and cosmetic containers of all sorts. These items fell right in line with the Scovill company's activity because bronze and brass and copper had been the company's principal raw materials not only during the war but before and after as well.

In order to compete in this cosmetic field, it was necessary to get out products which were almost in the jewelry class in design and workmanship, and the first step, therefore, was to add an art and design department as part of the production unit. This new department was then used in developing products in other fields. Sales methods and new outlets were developed simultaneously with the development of new products. The general scheme was to place likely products on the market in rapid succession and if they took hold to carry them on with renewed effort. If they did not take hold they were discarded at once and the stock sold at a sacrifice if necessary.

Takes Advantage of Prompt Delivery

INASMUCH as many of the new products were designed to sell at low prices, some through the 5 and 10-cent stores, it was necessary to get the production costs down to the lowest possible basis. The years from 1922 to 1930 had contributed much to transportation efficiency. The dependability of materials delivery increased manyfold during those years. Thus in 1930 confidence in delivery of raw and semi-finished material made it possible to cut the inventory to a small portion of that felt necessary before the war.

One of the most difficult adjustments during the present depression has been reduction of overhead. During times of prosperity the overhead ratio decreases as the direct labor increases and, conversely, during times of depression the overhead ratio increases as the direct labor decreases. To overlook this may be disastrous.

The Scovill company made a thorough study of all office work and, in fact, all jobs of the so-called "white collar" group. It was found possible to eliminate some whole departments as being unnecessary in the time of depression. Correspondence of the company was studied and it was found possible to use form letters to answer a large number of the daily inquiries. Standards in the clerical departments were improved, resulting in a reduction of these forces by nearly one-half. In one sense the depression has been seized on as an opportunity to put in effect the economies which for reasons of policy are difficult or even impossible to effect in times of prosperity, but which nevertheless make the whole unit better equipped to face whatever may be ahead in the way of competition or demand.

Drastic Reduction in Distribution Costs

IN developing outlets, the company has sought to help the retailer rather than try to eliminate him. One of the last strongholds of high cost lies in distribution and the company officials believe that one of the strongest bids for a return of prosperity will come through drastic reduction in this particular field. Most of the attempts at reducing distribution costs are in the line of palliatives and do not get to the cause.

One of the most successful distributing plans of the Scovill company has been the use of well organized sales forces of subsidiary companies as channels for distributing new products. Thus the salesmen of a subsidiary handling automobile tire hardware and tools have been asked to add many of the miscellaneous accessories manufactured by the Scovill company which would naturally appeal to the larger garages and automobile specialty shops regularly called on by these salesmen. Another example is the case of the Morency-Van Buren Division, Sturgis, Mich., which manufactures plumbers' brass goods. The salesmen for this company have been asked to add to their line bath and shower fixtures and many bathroom accessories which are readily distributed through the same channels.

Wrought Iron Welded by Both Plastic and Fusion Processes

IN major features the welding of wrought iron parallels that of steel, both in technique and results, according to James Aston, A. M. Byers & Co., Pittsburgh, in an address on the "Welding of Wrought Iron," at the recent annual meeting of the American Welding Society. But there are special considerations that must be taken into account; Mr. Aston discussed these in detail, giving also an interesting outline of the physical and other characteristics of wrought iron.

"The past few years have seen iron put upon a plane of manufacture closely paralleling that of steel in tonnage and cost possibilities," he said. "Expansion of markets should result, and the product is already available or in course of exploitation in the form of plate, sheets, wire, bars and forging stock in addition to pipe, which has been the important outlet in recent years. Alloy wrought iron with improved physical properties is an accompanying development." In view of this, said Mr. Aston, it is appropriate that attention be given the welding characteristics of this material.

Two types of welding were considered—plastic and fusion. In plastic welding the chemical composition and physical characteristics of the metal are of primary importance. Temperature and pressure during the welding are also vital.

Well-made wrought iron possesses the desirable attribute of very low metalloid content and absence of segregation of constituents, he pointed out. In addition, the inclusion of iron silicate slag has a marked physical action in protecting the metal during heating and fluxing the oxides so that better surfaces are presented for the plastic union of iron to iron.

Research, he said, has disclosed that the composition of the slag has a marked influence upon the welding quality in pipe manufacture. In view of the fact that the newer developments in wrought iron production enable intimate control of both slag and metal characteristics, welds of uni-

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Solving Problems Which Vex the Rustless Steel Industry

At the annual spring meeting of the American Iron and Steel Institute on May 19 in New York a paper entitled "Stainless Production—Equipment and Method of Manufacture" was presented by E. C. Smith, assistant district manager, Central Alloy District, Republic Steel Corpn., Massillon, Ohio.

Almost every phase of this comparatively new industry was described in the 44 pages of this paper—metallurgical, raw material, rolling equipment, polishing, melting scrap, etc. Many of the problems which have been solved and some which still perplex the industry were discussed. The two written discussions follow.

Discussion by Walther Mathesius
Assistant General Superintendent, South Works, Illinois Steel Company, Chicago

THIS discussion is offered as a reciprocal commentary, supplementing rather than reviewing the paper, and is confined largely to those phases of the United States Steel Corpn.'s production in rustless steel which have been assigned to the Illinois Steel Co.'s South Works in Chicago.

The Steel Corporation's Alloy Program

This development represents part of a program inaugurated about 1925, when the Steel Corporation concentrated a large share of its alloy steel production at South Works. Open-hearth as well as electric steel producing facilities were available with ample capacity and of suitable design. Rolling and forging equipment was supplemented by substantial additions, which included a group of bar mills designed and operated specifically for the production of special and alloy steels.

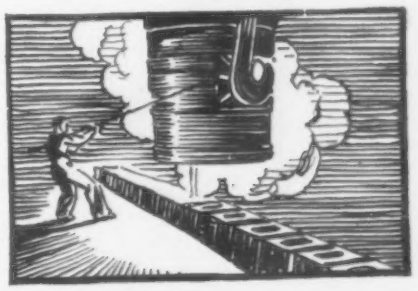
Starting with the production of the various heat-treating and case-hardening grades of alloy steel for which the principal demand arose from the automobile and the farm implement industry, this manufacturing plan has been expanded gradually, in keeping with trade conditions and with the capacity of the organization to render creditable service to a progressive industry with ever more exacting requirements in quality steels.

The manufacture of stainless and heat-resisting steels at South Works is one of the more recent additions to this program and covers production of finished rolled products in bars, plates and shapes, etc., as well as semi-finished materials for further conversion at other Steel Corporation plants into strip, wire, sheet and tubular goods.

Production to date has included the various chromium-nickel grades usually identified with the basic patents under the control of the Chemical Foundation, Inc., as well as the straight chromium steels containing up to approximately 30 per cent chromium, with the exception of the hardened or cutlery grades of the latter group.

The growth of this manufacturing program to its present competitive level, as measured by quality and quantity of production, has been greatly aided by the timely provision of adequate laboratory facilities and of a competent staff for metallurgical control and development work at the plant, and through the generous and valuable cooperation extended by the management and staff of the United States Steel Corpn.'s research laboratories in Kearny, N. J.

This support has been distinctly effective in reducing to a minimum the necessity of following the nearly always tedious and costly method of trial and error, replacing it by scientific correlation of cause and effect. It has facilitated intelligent planning of production and prompt adjustment of manufacturing problems, has promoted understanding among the various operating groups and thus measurably aided in laying the foundation for the successful development of a relatively difficult undertaking.



During the melting and teeming of the various stainless steel types, no serious difficulties were encountered in meeting chemical and physical requirements. Care and diligence were recognized as essentials in the making of these rather delicate products with relatively high cost of materials and destined for exacting service. Special attention has been paid to thorough deoxidation prior to the addition of the ferrochromium alloy as well as for the entire remaining period of the heat.

Correct Heating of Ingots Essential

A substantially more difficult task was found to be the adaptation of existing soaking pits and heating furnaces, and the adherence to time-temperature schedules in keeping with the exacting requirements of the various rustless steel grades. In the light of our present knowledge, it appears certain that throughout the various hot working processes applied to rustless steel, correct heating is the most important requirement as well as the one most difficult to achieve.

Compared with the common types of carbon steels, all grades of chromium-bearing rustless and heat-resisting steels have a distinctly lower thermal conductivity. For this reason, much longer heating cycles as well as a materially reduced rate of heat input must be observed if costly failures during rolling and defective products are to be avoided. Insufficient soaking throughout the mass is, as a rule, readily recognized because of the excessive power input required for hot deformation.

More frequent, and more difficult to control, is over-heating. In the chromium-nickel grades such faulty heating practice promotes excessive grain growth as well as decomposition of the austenitic structure, both resulting in reduced ductility and consequently in breaking up and tearing during rolling or forging.

In the straight chromium grades, the tendency toward excessive grain growth becomes more pronounced with increasing chromium content, and is always a direct function of heating temperature and heating time. For best results in the hot working of these grades, it is therefore important to provide an ample

soaking period at temperature levels below the zone of rapid grain growth and not to extend unduly the heating time at the higher temperatures required for rolling.

High Strength at High Temperatures

The outstanding phenomenon during the rolling of the chromium-nickel grade is their high strength at elevated temperatures, which, in comparison with ordinary steels, requires materially greater force for equal deformation. Heavy mill equipment and ample driving power are therefore essential. As a rule, the lower limit of the practical range in rolling temperatures is directly determined by this characteristic behavior. For these reasons, the successful rolling of large ingots in this steel type is no small task.

Experience and care have shown the way, however; inverted hot topped ingots in the regular USS 18-8 grade, weighing in excess of 60,000 lb., and measuring approximately 30 in. x 64 in. in cross-section, are now rolled at South Works with good results, the product consisting mainly of slabs for further conversion through a 10-stand, 96-in. continuous plate mill.

Compared to the power requirement and temperature limits encountered in the chromium-nickel grades, the rolling of the straight chromium grades is a somewhat easier problem. After suitable heating, these materials are rather easily deformed when rolling with normal drafts.

The specific feature which must be recognized for satisfactory results in these grades is that, with increasing chromium and with decreasing carbon content, these steels remain ferritic throughout the entire temperature range available for hot working. Consequently they offer no opportunity for grain refinement and corresponding toughening through heat treatment after rolling. To avoid brittleness and to obtain a satisfactorily small grain size, suitable for cold working of the product, such as bending of plates or machining, chipping and grinding, the temperature of the final hot deformation must be closely controlled. It should always be low enough to insure the desired grain refinement and to avoid subsequent grain growth during cooling after rolling.

Scrap Melted in High-Frequency Furnace

For the remelting of rustless steel scrap, an electric induction furnace installation of the high-frequency coreless type is used at the Chicago plant. The equipment, of Ajax-Northrup design, consists briefly of a 1250-k.v.a. motor generator set, which furnishes current at 1000 cycles and approximately 900 volts, and a 4-ton crucible-type furnace unit, together with suitable switch gear and capacitator banks. A second furnace unit is in course of construction and is expected to provide for maximum flexibility of the melting program as well as for practically continuous utilization of the generating and control equipment, which forms the major part of this installation from the standpoint of investment.

Placed in operation during November, 1931, this melting plant represents in several respects, including its size, a somewhat drastic departure from earlier standards. It was decided upon because it offered the possibility of attractive advantages over the low-frequency ring-type induction furnace—for instance, greater ease of charging, of slag manipulation, and of stirring control. With a relatively simple structure and with accessible bath and lining contour, it promised ease of maintenance and flexibility, being operative at will, either on a continuous melting program for a large number of consecutive heats of the same grade, or charged intermittently and for widely different specifications with a minimum of contamination and interference.

Although this equipment has not been in operation long enough to justify final statements concerning capacity and costs, it can be said that the results obtained so far have been gratifying and in keeping with expectations. Substantial tonnages of scrap have been remelted satisfactorily with regard to furnace practice as well as to steel quality and numerous other specifications have been produced successfully, justifying the belief that this relatively novel tool will find a wider field of application in the steel plant practice of the future.

Overcoming Intergranular Corrosion

One of the most serious disadvantages in the physical properties of the straight chromium steels, which has limited their wider application, is no doubt their lack of ductility after welding and their tendency toward embrittlement after prolonged exposure to temperatures around 900 deg. F. For these characteristics no satisfactory corrective measures have become known so far. The industry must, for the present, recognize these limitations and avoid failures by guarding against applications of these grades to manufacturing practices and uses for which they are not suited.

While the chromium-nickel grades, such as the 18-8 type, are not subjected to these limitations and represent in fact, as the author has pointed out, unusually favorable materials for welding, there is nevertheless no little concern among users because of substantially lowered corrosion resistance experienced after welding and also because of serious embrittlement encountered after prolonged high temperature service in the range of, say, 1100 to 1600 deg. F.

The author has shown that these tendencies have been definitely associated with intercrystalline weaknesses and intergranular corrosion phenomena, caused by carbide precipitation. To prevent this migration of the chromium carbides, a number of corrective alloying additions have been made and have shown moderately improved results. The benefits derived in this respect from a lowering of the carbon specification are limited because the lowest carbon content obtainable today in commercial practice is still at least 0.03 per cent higher than would be required for a true elimination of the precipitation phenomenon.

For the present, the practical solution of this difficulty is not so much in the direction of lower carbon content, but in alloying additions capable of accelerating the precipitation of carbides without involving the chromium alloy in their composition.

Titanium Indicated as a Corrective

Commercial manufacture of 18-8 products with suitable percentages of titanium added to the steel as required for the binding of the carbon content into stable titanium carbides has been successfully accomplished in this country as well as abroad, and recent laboratory results indicate a resistance against intercrystalline attack approximately 100 times greater than obtainable in the ordinary 18-8 grade with carbon under 0.07 per cent. It is expected that this titanium-bearing alloy will substantially widen the field of profitable application for heat-resisting purposes as well as for welded corrosion-resistant structures.

A review of the present cost of stainless steel products should, in fairness to all, consider separately the cost of materials, of production, and of fabrication. Using the cost of ordinary steels as a standard of comparison, it is easily seen that the addition of from 15 to 25 per cent and higher of more costly alloys will always require a larger outlay for materials. Yet there is every reason to expect at least a moderate reduction in the price of these commodities with increased production and correspondingly lower manufacturing costs.

Similarly those skilled in the art will readily perceive that, due to the inherent physical properties of the rustless steels, their production and processing will always be more cost-

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A Comparative Cost System for the Steel Industry

By RALPH H. SWEETSER

In The Iron Age of May 26, 1932, Mr. Sweetser set forth the general principles underlying a good cost system for a blast furnace plant, and listed the eight items for which "base" or "ideal" costs must be ascertained before a true measure of operating efficiency can be obtained. In the current instalment of his article he takes up each one of these items, explaining in detail how the bases are arrived at.

THE capacity of a blast furnace must be expressed in tons (2240 lb.) of pig iron per 24 hr., in spite of the fact that the generally accepted rule established by the Southern Ohio Pig Iron and Coke Association in 1920 expresses blast furnace capacity in pounds of coke burned in 24 hr.

This rule is that a blast furnace of modern construction should burn 60 lb. of coke per cubic foot of working volume in 24 hr. The base coke in this system contains 90 per cent fixed carbon (at 212 deg. F.) and 3 per cent moisture as received. The "working volume" of a blast furnace is the cubical contents from the level of the center line of the tuyeres to a level 2 ft. below the big bell when closed.

A "big-hearth" furnace will make more pig iron than a furnace with less diameter in the hearth to the extent of the increase in the working volume, and no more; and even not then unless the other dimensions of the furnace are properly proportioned. There is something wrong somewhere when a blast furnace does not burn about 60 lb. of coke per cubic foot of working volume in 24 hr.; the trouble is either in the coke or in the furnace; if it is in the furnace, it may be in construction, in equipment, or in the handling of the furnace.

This rule holds good regardless of the kind of iron that is being made, because the tonnage of coke consumed is the governing factor. Some kinds of iron require more coke per ton and, therefore, the tons of that kind of pig iron produced on the total coke consumed in 24 hr. will be less.

Base Ore Mixture

The ore mixture basis of this system contains 51.50 per cent iron (Fe) in the natural state. The theoretical yield of such a mixture is 54.78 per cent pig iron containing 94 per cent Fe. The percentage of silica in this base ore mixture is assumed to be 8 per cent (natural). The quantity of ore mixture required per ton (2240 lb.) of pig iron is 1.825 tons (4088 lb.), containing a total of 210,-

PIG IRON
Cost Data Sheet No. 1
THE ..... COMPANY
..... Division
DATA FOR MONTH OF 1931

	No. 1 Furnace	No. 2 Furnace	By
Total tons pig iron made			
Number of days in operation			
Average production per 24 hr.			
Total tonnage made on lining			
Date furnace blown in			
Cu. ft. of air blown per minute			
Cu. ft. of air at 60 deg. F. per lb. coke			
Theoretical yield at 94 per cent Fe			
Actual yield			
Average per cent Fe in mixture			
Loss in yield			
Average silica in mixture			
Average fixed carbon in coke			
Average sulphur in coke			
Average moisture in coke			
Average CaO in limestone			
Flue dust recovered (tons)			
Flue dust recovered (lb.)			
Flue dust recovered (lb.)			
Flue dust sintered (tons)			
Pounds flue dust per ton pig iron			
Total man-days worked			
Total hours worked by hr. per man-day			
Total hours worked by sinter plant			
Total hours worked by salaried employees			
Total hours worked on construction			
Total hours worked unloading to stockpile			
Net hours labor entering the labor cost			
Hours of labor per ton of pig iron			

PIG IRON
Cost Data Sheet No. 4
THE ..... COMPANY
Consumption, Production and Loss Statement
..... FURNACE MONTH OF 193

Ore Mixture	Tons Used	% Fe (Natl.)	Total Ton-Units of Fe
..... ore			
..... ore			
..... ore			
..... ore			
..... ore			
..... ore			
Sinter			
Roll scale			
O. H. slag			
Scrap			
Coke			

Total Ton-Units .....
Total pig @ 94% Fe .....
Actual tons pig made .....
Difference in tons to be accounted for .....
Otherwise accounted for:

	Tons	% Fe Nat.	Total Ton-Units Fe
Flue dust			
Slag			
Total Fe otherwise accounted for =			
Equivalent in pig iron at 94%			
Gross tons pig iron in furnace (proportion of next cast)			
Total tons otherwise accounted			

Gain .....
Unaccounted for Loss .....

532 units of iron (Fe), assuming that there is 100 per cent recovery, which is practically impossible but often is so recorded in the cost sheets. This basis is for Lake Superior iron ores; the same principles could be applied to Alabama ores or to New York and New Jersey magnetites.

A balance sheet of all units of iron bought and delivered into the furnace is carefully kept, so as to guide the management in the accounting and in the inventory. It is not unusual for the balance sheet (Cost Data Sheet No. 4, called the "Consumption, Production and Loss Statement") to show a greater recovery of pig iron than is theoretically possible. When this persists month after month, it is certain that there are errors in the furnace records somewhere; weights of material or of product may be wrong; samples taken for analysis may not be truly representative. Each month all of the units of iron contained in the ore mixture charged into the furnace are debited and all the units of iron in the pig iron, in the flue dust, and in the slag are credited and the difference is "unaccounted-for" loss or gain for that month.

This Consumption, Production and Loss Statement is a keen metallurgical and inventory check on blast furnace operations, and a guide for the supervision of sampling, analyzing, weighing and accounting. This record begins with the filling of ores into the furnace for blowing-in and continues throughout the blast. If the records are accurately kept there will be a certain "unaccounted-for" loss which will represent that loss of iron in manufacture that was not recovered as pig iron, castings or scrap, or accounted for in flue dust or slag.

Adjustments for variations of the percentage of iron in the ore mixture will be explained later under the subject of "Adjustments."

Base Coke

The base coke adopted for the comparative cost system contains 90 per cent fixed carbon (at 212 deg. F.) and 3 per cent moisture as received; railroad weights govern. The coke should be tough, but not dense or fragile, and free from breeze. This is called "commercial coke" (to distinguish it from "dry coke").

It is assumed that it requires 1800 lb. of commercial coke as described above, to make one ton of pig iron from an ore mixture containing 51.50 per cent iron (Fe) natural and with blast temperature at 1200 deg. F. The base coke contains 1 to 2 per cent volatile matter and less than 1 per cent sulphur; obviously the ash in the base coke will not be over 9 per cent. Adjustments for variations in the analysis of the coke used will be explained later on.

Base Limestone

The base limestone is calcite with 49 per cent CaO. A calcite limestone without any magnesia is a very unsatisfactory flux in the blast furnace and often it is necessary to use some dolomite mixed with the calcite.

Adjustments on account of variations in percentage of CaO and the use of open-hearth slag in the ore mixture will have to be made.

Labor

Just as it is necessary to know how much pig iron a blast furnace will produce in a day, just so is it necessary to know how much a man should do in a day's work at a blast furnace; a man-day at a blast furnace is one man working the **standard 8-hr. day.**

The ideal amount of labor per ton of pig iron, expressed in hours and in money, is found by dividing the ideal daily tonnage of the blast furnace into the total hours of labor and the total cost of labor per day as shown on the standard force sheet approved by the management and in use throughout the cost period.

The ideal labor cost includes all the items of labor included in the regular cost sheets used for pig iron. All salaries charged against pig iron are included in the cost for overhead.

The standard force sheet shows the total number of employees on the hourly payroll, and shows the total number of hours worked by all the wage-earners in a 24-hr. period, and the total wages earned. From these figures are derived the hours of labor per ton of pig iron and the average rate of wages per hour. The ideal labor cost for the ideal tonnage can then be shown.

Adjustments for variations in rates and tonnages must be calculated.

Supplies and Service

The cost of supplies and the cost of service are combined into one item in the comparative cost system under the heading of "Supplies and Service." The total cost of this item for a 24-hr. period is ascertained by adding the average daily quantities and costs of coal, sand, refractories, bronzes, tools, chemicals for water treatment, all materials in repairs and maintenance, lubricants, yard switching, locomotive crane service, electric light and power, steam, and any other supplies and services that are included in the regular cost sheets. The management must agree with the superintendent on a reasonable amount for this ideal cost.

The ideal cost for supplies and service is expressed in total cost per 24 hr., and then in cost per ton for the ideal daily tonnage. This item does not have to be adjusted each month except that the per-ton cost will vary directly with the average daily production of pig iron. However, there are so many small items included under this heading that it is advisable to review the whole list of supplies and service occasionally so as to make the necessary revisions. Changes in practice, equipment, or accounting

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PIG IRON

COST DATA SHEET No. 2

THE ____ COMPANY

DIVISION

Data for Month of ____ 19__

FURNACE						
CHARGE	Lbs. Per Ton Pig	Tons Per Ton Pig	TOTAL TONS USED	Price Per Ton	TOTAL COST	Cost Per Ton Pig
Ore, and Metals (2240 lbs. ton)						
Coke (2000 lbs. per ton)						
Limestone (2000 lbs. per ton)						
Labor Total Hours			@	per hour		
Supplies and Service			Per day for	Tons		
Overhead			" " "	Tons		
Depreciation			; Relining and Renewals	per ton		
TOTAL						
PRODUCTION		TONS—IDEAL PRODUCTION FOR THIS MONTH				TONS

FURNACE						
CHARGE	Lbs. Per Ton Pig	Tons Per Ton Pig	TOTAL TONS USED	Price Per Ton	TOTAL COST	Cost Per Ton Pig
Ore, and Metals (2240 lbs. ton)						
Coke (2000 lbs. per ton)						
Limestone (2000 lbs. per ton)						
Labor Total Hours			@	per hour		
Supplies and Service			Per day for	Tons		
Overhead			" " "	Tons		
Depreciation			; Relining and Renewals	per ton		
TOTAL						
PRODUCTION		TONS—IDEAL PRODUCTION FOR THIS MONTH				TONS

TOTALS FOR BOTH FURNACES			
	TONS PIG	TOTAL COST	COST PER TON
East Furnace			
West Furnace			
Both Furnaces			

19 DATA FURNISHED BY

Available Tool Steels Classified As to Brands and Types

By EDWIN F. CONE

BECAUSE of the great variety of tool and cutting steels and alloys, each characterized by differences in analysis and properties, considerable confusion is associated with the identification of many of them. Each has a brand name, but in many cases this does not give any clue as to the composition, properties or uses. Many requests come to THE IRON AGE for information on these steels.

In order to clarify this situation, a survey has been made which includes all American products and most of the imported brands. Due to the excellent cooperation of the companies approached, it has been possible to collect data which cover the brand name, the type with which it is identified, the predominating or determining element or elements and, in a majority of cases, the chief applications.

Every organization in the United States which could be identified as a producer, agent or importer was solicited. It is fortunate to be able to say that data were obtained from every producer and agent at present in business and from all importers but one. In some cases certain details were not obtainable, but as a whole the data are quite complete.

Seventy-four companies were found to be doing business under brand names in the United States. Replies were received from 73 of these, which are listed in a table with a number assigned to each company for identification in other tables.

The questionnaire which was sent to each company requested information under four different heads: brand name, type, determining element, and applications.

Presentation of the data obtained has been concentrated in two tables besides the one giving the source. One table is an alphabetical list of brands which includes the type of steel and the determining element, with the key number to identify the producer or agent.

In a third table there is presented a classified list of brands by type of steel represented: carbon, high-speed, special alloy, non-deforming, cemented carbides and unclassified. In the last, unclassified, are grouped certain brands concerning which adequate information was not available. It is also to be understood that in some cases the information furnished left some doubt as to the exact type of steel designated, but so far as possible the data furnished by each company have been closely followed. In this table it has been possible to give some of the chief applications of each brand.

From this arrangement of the data, it is possible from one table to locate the producer or agent for any of the 590 or more brands of tool or cutting steels and alloys available in the American market and at the same time identify the type. In the other table, steels suitable for certain applications can be identified among the types which arrange themselves as follows:

Type	Number
Carbon	167
High-speed	89
Special alloy	261
Non-deforming	57
Cemented carbide	7
Hard alloy	2
Unclassified	13
Total	596

One of the surprises is the very large number of special alloy steels, over 260, which vary widely in composition due to the use of different alloying elements. Second to these are naturally the 167 carbon steels. The fact that there are nearly 90 high-speed brands is something of a surprise. The non-deforming classification, with 57 brands, is probably not all-inclusive, because of inadequate information furnished in some cases. Already there are seven cemented carbides listed. The two hard alloys are placed under the high-speed steels.

That the tool steel industry is a comprehensive and important one is impressively evident from this survey. The advent of alloy steels and the electric furnace early in this century have made its expansion possible. Thirty years ago most of the tool steel was of the carbon type and made in crucibles. As the survey shows, a large majority of the current brands involve the use of alloys and consequently of the electric furnace in their production. Add to this the fact that careful heat treatment is necessary to bring out the full qualities of the steels and that heat-treating practice, perfected in quite recent years, involves much new equipment, and the full import of the tool steel industry is manifest. Associated with the development of tool steels has been the greater expansion of the machine tool industry which, due to new steels and alloys, has made great strides in the last twenty years. Introduction of high-speed steels necessitated many changes in the design of machine tools and in their efficiency. Already the use of the cemented carbides is having a similar effect on the machine tool industry, but it is too early to measure its extent.

Tool Steel Producers and Agents

No.	Producer or Agent	Location
	A	
1.	Adams & Osgood Steel Co.	23 Purchase St. Boston, Mass.
2.	Allen Steel Co., Edgar, Inc.	741 Washington St. New York, N. Y.
3.	Anchor Drawn Steel Co.	Latrobe, Pa.
3A.	Andrews Steel Co.	Newport, Ky.
4.	Andrews, Toledo, Ltd.	26 Cortlandt St. New York, N. Y.
4A.	Armstrong Bros. Tool Co.	309 N. Francisco Ave. Chicago, Ill.
4B.	Atlantic Steel Co.	1775 Broadway. New York, N. Y.
	B	
5.	Bethlehem Steel Co.	Bethlehem, Pa.
6.	Bissett Steel Co.	947 East 67th St. Cleveland, Ohio
7.	Boker & Co., H., Inc.	101 Duane St. New York, N. Y.
8.	Bourne-Fuller Div. Republic Steel Corpn.	1912 Scranton Rd. Cleveland, Ohio
9.	Boyd-Wagner Co.	Chicago, Ill.
10.	Braeburn Alloy Steel Corpn.	Braeburn, Pa.

No.	Producer or Agent	Location
	C	
11.	Cannon-Stein Steel Corpn.	Syracuse, N. Y.
12.	Carboloy Company, Inc.	2841 E. Grand Blvd. — Detroit, Mich.
13.	Carpenter Steel Co.	Reading, Pa.
15.	Colonial Steel Co.	Monaca, Pa.
16.	Columbia Tool Steel Co.	Chicago Hts., Ill.
17.	Craine-Schrage Steel Co.	6189 Hamilton St. — Detroit, Mich.
18.	Crowley, John A.	120 Liberty St. — New York, N. Y.
19.	Crucible Elec. Steel Corpn.	125 East 7th St. — Homestead, Pa.
20.	Crucible Steel Co. of America	Chrysler Bldg. — New York, N. Y.
21.	Cyclops Steel Co.	Titusville, Pa.
	D	
22.	Darwin & Milner, Inc.	1260 West 4th St. — Cleveland, Ohio
23.	Detroit Alloy Steel Co.	Ft. of Iron St. — Detroit, Mich.
24.	Disston & Sons, Inc., Henry	Philadelphia, Pa.
25.	Driver-Harris Co.	Railroad Ave. and 4th Street — Harrison, N. J.
26.	Duke Steel Co., Inc.	99 Beekman St. — New York, N. Y.
	E	
27.	Ekstrand & Tholand	1 East 42nd St. — New York, N. Y.
	F	
28.	Firth-Sterling Steel Co.	McKeesport, Pa.
29.	Frasse, Inc., Peter A.	17 Grand St. — New York, N. Y.
	H	
30.	Halcomb Steel Co.	Syracuse, N. Y.
30A.	Edward L. Hand & Co.	521 Arch St. — Philadelphia, Pa.
31.	Hawkridge Brothers	303 Congress St. — Boston, Mass.
32.	Haynes Stellite Co.	30 East 42nd St. — New York, N. Y.
33.	Heller Brothers Co.	879 Mt. Prospect Ave. — Newark, N. J.
33A.	Hidalgo Steel Co., Inc.	74 Varick St. — New York, N. Y.
34.	Hobson, Houghton & Co., Inc.	792 Greenwich St. — New York, N. Y.
35.	Houghton & Richards, Inc.	145 Oliver St. — Boston, Mass.
	I	
36.	Illingworth Steel Co., John	Frankford, Philadelphia, Pa.
	J	
37.	Jessop & Sons, Inc., Wm.	121 Varick St. — New York, N. Y.
38.	Jessop Steel Co.	Washington, Pa.
	K	
39.	Kidd Drawn Steel Co.	Aliquippa, Pa.
40.	Kloster Steel Corpn.	1036 W. Lake St. — Chicago, Ill.
	L	
41.	Latrobe Electric Steel Co.	Latrobe, Pa.
42.	Ludlum Steel Co.	Watervliet, N. Y.
	M	
43.	McDonald & Co., P. F.	17 King Terminal — Boston, Mass.
44.	McInnes Steel Co., Ltd.	Corry, Pa.
45.	Midvale Co.	Nicetown, Philadelphia, Pa.
46.	Milne & Co., A.	741 Washington St. — New York, N. Y.
	O	
48.	Onondaga Steel Co., Inc.	Syracuse, N. Y.
	P	
49.	Paragon Steel & Tool Co., Inc.	East Rutherford, N. J.
50.	Patriarche & Bell	53 Carmine St. — New York, N. Y.
51.	Peninsular Steel Co.	1030 McDougall Ave. — Detroit, Mich.
52.	Pittsburgh Tool Steel Wire Co.	Monaca, Pa.
53.	Poldi Steel Corp. of Amer.	245 W. 18th St. — New York, N. Y.
55.	Prosser & Son, Thomas	15 Gold Street — New York, N. Y.
56.	Purdy Co., Inc., A. R.	790 Greenwich St. — New York, N. Y.
	R	
57.	Ramet Corpn. of America	North Chicago, Ill.
58.	Ryerson & Son, Inc. Joseph T.	16th and Rockwell Sts. — Chicago, Ill.
	S	
59.	SKF Steels, Inc.	40 East 34th St. — New York, N. Y.
60.	Simonds Saw & Steel Co.	Fitchburg, Mass.
61.	Stulz Sickles Co.	140 Lafayette St. — Newark, N. J.
62.	Swedish-American Steel Corpn.	433 Kent Ave. — Brooklyn, N. Y.
63.	Swedish Iron & Steel Corpn.	17 Battery Place — New York, N. Y.
	T	
64.	Timken Steel & Tube Co.	Canton, Ohio
65.	Tennessee Coal, Iron & Railroad Co.	Birmingham, Ala.
	U	
66.	Uddeholm Co. of America, Inc.	155 East 44th St. — New York, N. Y.
67.	Universal Steel Co.	Bridgeville, Pa.
	V	
68.	Vanadium-Alloys Steel Co.	Monaca and Latrobe, Pa.
69.	Vulcan Crucible Steel Co.	Aliquippa, Pa.
70.	Wheelock, Lovejoy & Co., Inc.	128 Sidney St. — Cambridge, Mass.
	Z	
71.	Ziv Steel & Wire Co.	2945 W. Harrison St. — Chicago, Ill.

Tool Steel Brands, Alphabetically Arranged

Brand	Type	Determining Elements	Producer or Agent
	A		
A. B. C.	Special alloy (Low carbon)	W, Cr	No. 22
Acorn	Drill Steel	C	No. 63
Acorn	Carbon	C	No. 63
Air Hardening	Special alloy Air hardening		No. 8
Airdi	Special alloy	C, Cr, V, Mo	No. 20
Ajax	Special alloy	C, Cr, V	No. 21
Ajax Drill Rod	Carbon	C	No. 39
Albany	Special alloy	Cr, V	No. 42
Albion Special	High speed		No. 34
Albor Die	Special alloy		No. 37
Alco	Special alloy	C, Cr, V, W	No. 21
Alloy C	Special alloy		No. 37
Alloy finishing	Special alloy		No. 10
Alpha	Special alloy	W	No. 45
Alva Extra	Special alloy	V	No. 20
Alva Special	Special alloy	V	No. 20
AMCOH Special	Non-deforming	Mn, Cr, W	No. 46
Andard	Carbon	C	No. 26
Annite (Cast)			No. 6
Apollo	Special alloy	C, Cr, V	No. 21
Armide	Carbide alloy		No. 4-A
Arrestite	Non-deforming		No. 8
Arrow Oil-Hardening	Non-deforming	W, Mn	No. 9
Arrow High Speed	High speed	W	No. 18
Arrow Special	Carbon	C	No. 18
Asco	Carbon	C	No. 3A
Atha Pneu	Special alloy	Cr, W, V	No. 20
Atha Rim Roll	Special alloy	Cr	No. 20
Atlantic 33	Special alloy	Cr, Mn, Mo	No. 4B
Atlas No. 93	Special alloy	Cr, Mo	No. 42
	B		
B. D. Tool	Carbon	C	No. 20
Balfosteel	Carbon	C	No. 1
Baltoc	Cobalt high speed		No. 30
Best	Carbon	C	No. 36
Best	Carbon (Water Hardening)	C	No. 9

Brand	Type	Determining Elements	Producer or Agent
Best	Carbon	C	No. 6
Bethlehem Comokut High Speed	High speed	Co, Cr, W, V	No. 5
Bethlehem Finishing	Special alloy	W	No. 5
Bethlehem Lehigh Die and Tool	Non-deforming (High C, High Cr)	C, Cr	No. 5
Bethlehem No. 57 Hot Work	Special alloy	Cr, W	No. 5
Bethlehem No. 445 Hot Work	Special alloy	Cr	No. 5
Bethlehem Omega	Special alloy	Si, Mn, Mo	No. 5
Bethlehem Special High Speed	High speed	Cr, W, V	No. 5
Bethlehem Tool Room, Oil Hardening	Non-deforming	Mn	No. 5
Bethlehem XCL	Carbon	C	No. 5
Bethlehem XX	Carbon	C	No. 5
Bethlehem XXX Special	Carbon	C	No. 5
B-F High Speed	High speed		No. 8
B-F Tool	Carbon	C	No. 8
Black Diamond Drill	Carbon	C	No. 20
Black Label	Special alloy	Cr, V	No. 51
Black Label Cast (Extra)	Carbon	C	No. 37
Blue Anchor Drill Rod	Carbon	C	No. 3
Blue Chip	High speed		No. 28
Blue Label	Carbon	C	No. 51
Blue Label	Carbon	C	No. 33
B. M. S.	Special alloy	W	No. 33-A
B. N. D.	Special alloy	Cr	No. 7
Bonded Carbide	High speed		No. 10
Borite	Carbon	C	No. 62
Brown Label	Special alloy	Cr	No. 33
Bush Hammer	Special alloy	V	No. 20
Buster Brand	Special alloy	Cr, W	No. 16
B-4	Special alloy	C, Cr, V, W	No. 21
B-6	High speed	C, Cr, W, V	No. 21
B-7	High speed	C, Cr, W, V, Co	No. 21
B-9	High speed	C, Cr, W, V, Mo	No. 21

C

C. C. S. Die	Special alloy	Cr, W, Si	No. 20
Calo Ferro	Special alloy		No. 69
Carbo	Carbon	C	No. 6
Carboloy	Cemented carbide	Tantalum or tungsten carbide	No. 12
Carbomang (Cast)	Carbon	Mn	No. 23
Carbon	Carbon	C	No. 25
Castaloy (Cast)	Special alloy	Cr	No. 23
Cast Composite	Carbon		No. 2
C. C. S. Die	Hot work		No. 30
Cello Vanadium	Non-deforming	Cr	No. 44
C. E. M.	Carbon	C	No. 41
Champion	High speed		No. 20
Champion Extra	Special alloy	W	No. 20
Champion Non-Changeable	Special alloy	Mn, Cr, W	No. 20
Checkno	Special alloy	W	No. 6
Chippaway	Carbon	C	No. 38
Chiz-Alloy	Special alloy	Cr, W, Mo	No. 40
Choice	Special alloy	Cr	No. 68
Chrome B 15	Non-deforming	Cr	No. 33-A
Chrome Die	Special alloy	Cr	No. 42
Chrome-Vanadium	Special alloy		No. 10
Circle C.	Super high speed		No. 28
Clarite	High speed	Cr, W, V	No. 16
Class P.	Carbon	C	No. 2
Cobalt High Speed	High speed	Cr, W, Co	No. 44
Colhed	Special alloy	V	No. 68
Colonial Six, Oil Hardening	Non-deforming	Mn	No. 15
Colonial No. 7	Special alloy	V	No. 15
Colonial Special No. 14	Carbon	C	No. 15
Colosso	Special alloy	W	No. 33-A
Comet	Carbon	C	No. 13
Composite	Carbon	C	No. 7
Composite Die	Carbon	C	No. 37
Constant	Non-deforming	Mn, W	No. 45
Crane	Carbon	C	No. 9
Crasco Green Label	Carbon	C	No. 17
Crasco White Label	Carbon	C	No. 17
Crasco Red Label	Special alloy	Mn, W, Cr	No. 17
Crasco Black Label	Special alloy	C, Cr	No. 17
Crasco Special Vanadium	Special alloy	V	No. 17
Crescent Hot Work No. 2	Special alloy	Cr	No. 20
Crescent Special Alloy	Special alloy	Cr, W, V	No. 20
Crocar	Special alloy	Cr	No. 68
Cromo	Special alloy	Cr, Mo	No. 6
Cromovan	Triple die		No. 28
Cromva	Special alloy	Cr, V	No. 6
Crusca New Process Hollow Drill	Carbon	C	No. 20
Crusca V. J. Special	Special alloy	W	No. 20
Crusca V. J. Extra	Special alloy	W	No. 20
Crow	Special alloy	Cr	No. 42

D

Darwin 505	High speed	Co, W, V	No. 22
Deo	Carbon	C	No. 7
Dense Steel	Special alloy	Cr, Si, Mo	No. 20
Deward	Non-deforming (Oil hardening)	Mn, Mo	No. 42
Diamond	Special alloy	Cr	No. 45
Diamonite	Special alloy	W	No. 18
Dixi 3	Non-deforming	Cr	No. 33-A
Double Special	Special alloy	W	No. 20
Double Seven	Special alloy	Cr	No. 2
Double Six Die	Non-deforming	C, Cr	No. 2
Double Special	Special alloy		No. 30
Double Special	Special alloy	W	No. 16
Draco	Special alloy	C, V	No. 21
Dreadnought	High Speed		No. 30
Dualoy	Special alloy	W	No. 26
Dukane	Carbon (Drill rod)	C	No. 52
Dukane (Cold drawn)	Carbon	C	No. 52
Dukex	Special alloy	W	No. 26
Dumost	Special alloy	V	No. 8
Durabil	Carbon	C	No. 26
Duranmium	High speed	W	No. 26
Duredge	Special alloy	W	No. 62
Duro	Carbon (double high)	C	No. 44
Dutrax	Carbon	C	No. 26
Duvan	Special alloy	V	No. 26
Dynamo	Carbon	C	No. 50

E

Electrite Cobalt	High speed	C, W, Cr, V, Co	No. 41
Electrite Super Cobalt	High speed	C, W, Cr, V, Co	No. 41
Electrite Ultra Cobalt	High speed	C, W, Cr, V, Co	No. 41
Electrite Uranium	High speed	C, W, Cr, V	No. 41
Electrite Vanadium	High speed	C, W, Cr, V	No. 41
Electrite No. 1	High speed	C, W, Cr, V	No. 41
Elhanco	Special alloy	C, V	No. 30A
E. S. A.	Special alloy	C, W, Cr, V	No. 41
Excel Hollow Drill	Carbon	C	No. 15
Excelo	Special alloy	W	No. 13
Extra Chrome	Special alloy	Cr	No. 69
Extra	Carbon	C	No. 69
Extra	Carbon	C	No. 71
Extra	Carbon	C	No. 41
Extra	Water hardening	C	No. 13
Extra	Carbon	C	No. 10
Extra	Carbon	C	No. 16
Extra	Carbon	C	No. 8
Extra	Carbon	C	No. 21
Extra Best	Carbon	C	No. 36
Extra M G	Non-deforming	Mn	No. 35
Extra Punch	Special alloy	C, W, Cr, V	No. 41
Extra Quality	Carbon	C	No. 35
Extra Special	Carbon	C	No. 36
Extra Special	Carbon	C	No. 8
Extra Special	Carbon	C	No. 30
Extra Tool	Carbon	C	No. 20
Extra Tool	Carbon	C	No. 45
Extra Warranted	Carbon	C	No. 30
E. Z. 14 W.	Special alloy	W	No. 9

F

Fedol	Oil hardening		No. 63
FIREX	Special alloy	Ni, Cr	No. 22
First Quality	Carbon	C	No. 35
Firthaloy	Cemented carbide		No. 28
Firthite	Cemented carbide		No. 28
FJAB Extra	Carbon	C	No. 46
FJAB Hollow Drill	Carbon	C	No. 46
FJAB Regular	Carbon	C	No. 46
FJAB Rolled Auger	Carbon	C	No. 46
FJAB Solid Drill	Carbon	C	No. 46
FJAB Special	Carbon	C	No. 46
Folder Die	Carbon	C	No. 44
Fool-Proof	Special alloy	Cr, W	No. 43
Fort Pitt	Carbon	C	No. 69
Frasse Tempers, A.B., C.	Carbon	C	No. 29

Brand	Type	Determining Elements	Producer or Agent
G			
Gibraltar	Carbon	C	No. 7
Gold Anchor	High speed		No. 3
Gold Anchor Drill Rod	High speed		No. 3
Gold Label	High speed	Cr, W, V, Co	No. 33
Gold Star	High speed	W, Co	No. 13
Grade H	Special alloy	W	No. 29
Gralur	Carbon	C	No. 26
Green Label	Special alloy	C, W	No. 51
Gray Label	Non-deforming	Mn, Cr	No. 33
Green Label	Carbon	C	No. 33
Green Label Cast (Special)	Carbon	C	No. 37
Griffin	Non-deforming	Cr, Mn	No. 1
Gripmore	Special alloy	Cr	No. 6
G. S. N.	Non-deforming	C, Cr	No. 41
G. S. N. Special	Non-deforming	C, Cr	No. 41
H			
H	Non-deforming	C, V	No. 22
H. Y. C. C.	Special alloy	C, Cr, V	No. 20
Hack Saw	Special alloy	W	No. 37
Hack Saw	Carbon	C	No. 37
Hack Saw	Special alloy	W	No. 20
Halco	Special alloy		No. 30
Halcut	Special alloy		No. 30
Haldi	Special alloy (Air hardening)		No. 30
Hampden	Non-deforming	C, Cr	No. 13
Hardrite	Non-deforming		No. 69
Hargus	Non-deforming	C, Cr, Mn	No. 71
Hawk Brand	Carbon	C	No. 31
Hawk H	Special alloy	Cr, V	No. 31
Hawk Special	Carbon	C	No. 31
Hawk Vanadium	Special alloy	V	No. 31
Headmore	Special alloy	Cr, V	No. 6
Hecla	Special alloy		No. 69
Hidalgo	Special alloy	W	No. 33-A
Hi-Pro	Special alloy		No. 69
Hobson's Choice XX			No. 34
Hobson Non-Shrink	Non-deforming		No. 34
Hobson's Warranted Best			No. 34
Hollo	Carbon	C	No. 33-A
Hollow Bar	Special alloy	Cr	No. 43
Hot die No. 2	Special alloy	Cr	No. 10
Hot Header No. 3	Special alloy	W	No. 15
Huron	Special alloy (Oil hardening)	Cr, V	No. 42
Hypro	Non-deforming	Cr	No. 6
Hypro No. 62	Special alloy (High C, High Cr)	C, Cr	No. 9
I			
IDEOR	Special alloy (low carbon)	W, Cr	No. 22
Imperial	Special alloy	W	No. 2
Imperial Major	High speed	W	No. 2
Intra	Special alloy	W	No. 7
Invincible Drill Rod	Carbon	C	No. 39
J			
JC/C	Carbon	C	No. 27
J-Metal	Hard alloy	Co, Cr, W	No. 32
J. S. Steel	Special alloy	W	No. 28
J-4 Chisel	Special alloy		No. 37
K			
K	Special alloy	C, Cr, W	No. 21
KD 6	Special alloy	W, Co	No. 33-A
KD 10	Special alloy	W, Co	No. 33-A
Keystone	Special alloy	C, Cr, W, V	No. 24
Keystone	Special alloy		No. 10
KR	Special alloy		No. 69
K-9, Oil Hardening	Non-deforming	Mn	No. 2
Ketos	Non-deforming (Oil hardening)		No. 30
Kinite	Special alloy	Cr	No. 7
Kiski	Non-deforming		No. 10
Kloster Hollow Drill			No. 40
K-R Alloy	Special alloy	Cr	No. 13
Kromax	Special alloy (High C, High Cr)	C, Cr	No. 43
Kronos	Carbon	C	No. 29
Krovan	Special alloy		No. 30
KRUPP	Tool steel (all kinds)		No. 55
Kutkwik	High speed	C, Cr, W, V	No. 24
K-W	Special alloy	W	No. 13

Brand	Type	Determining Elements	Producer or Agent
L			
La Belle Special Hot Die	Special alloy	Cr, Ni	No. 20
La Belle No. 89 Die	Special alloy	Cr, V, Mo	No. 20
La Belle C & H	Special alloy	Ni, Cr, V	No. 20
La Belle Semi-Hot	Special alloy	Cr, W, V	No. 20
La Belle Silicon Punch No. 2	Special alloy	Cr, Si, Mn, Mo	No. 20
La Belle Silicon Punch No. 1	Special alloy	Cr, Si, Mn	No. 20
La Belle Eagle	Carbon	C	No. 20
La Belle 2-70	Special alloy	Si, Mn	No. 20
La Belle No. 211 Die	Special alloy	Ni, Cr, Mo	No. 20
La Belle No. 24 Die	Special alloy	C, Cr, V, Mo	No. 20
Latrobe	Carbon	C	No. 68
L. C. T. Alloy	Hot work		No. 30
Liberty	Special alloy		No. 30
Lion	Carbon	C	No. 38
L. L. C. T.	Hot work		No. 30
Lophos	Special alloy	C, V	No. 71
L-XX High Speed	High speed	Cr, W, V	No. 42
M			
MACCO Certified	Carbon (water hardening)	C	No. 43
Magic	Special alloy		No. 38
Mangano	Non-deforming	C, Mn	No. 41
Mansil	Non-deforming	C, Mn, V	No. 24
Marathon	Special alloy		No. 30
Martin (Cast)	Special alloy	Cr	No. 23
Marvel	Special alloy	W	No. 68
Master	Non-deforming	Mn	No. 26
Maximum	High Speed	W	No. 29
Maxite	High speed (super)	Cr, W, V, Co	No. 16
Maxtack	Special alloy	C	No. 2
McInnes Special	Carbon (high)	C	No. 44
Midvaloy No. 77	Special alloy	Cr, Mo	No. 45
Milo	Carbon	C	No. 33-A
Minerva Special	Special alloy	W	No. 2
Misco A	Carbon	C	No. 44
Misco B	Carbon	C	No. 44
Mohawk Hot Die	Special alloy	Cr, W, V	No. 42
Monaca	Carbon (drill rod)	C	No. 52
Monaca	Carbon (cold drawn)	C	No. 52
MoTung	High speed	Mo, W	No. 67
M Y	Special alloy	Cr, Si	No. 35
M Y Extra	Special alloy	W, Cr, Si	No. 35
N			
NEOR	Special alloy	C, Cr	No. 71
NEOR	Non-deforming (high carbon)	Cr	No. 22
New Rapid	High speed	W	No. 35
Non-Shrinkable	Non-deforming		No. 69
Nonshrink	Special alloy	W, Cr	No. 6
Non-Shrinkable	Non-deforming	Mn	No. 68
Normar	Non-deforming	C, Cr, Mn	No. 71
North Star	Non-deforming	W	No. 62
Novo Special	High speed	W, Cr	No. 7
Novo Superior	High speed	W, Cr	No. 7
No. 4 Hot Die	Special alloy	Cr	No. 2
No. 5 Hot Die	Special alloy	W	No. 2
O			
Oildie	Non-deforming	Cr	No. 16
One Star High Speed	High speed	W, V	No. 45
Onplus	High speed	W, Cr, V	No. 48
Ontario	Special alloy (air hardening)	Cr, Mo, V	No. 42
Orange Label	Special alloy	Cr, W	No. 33
Orion	Special alloy	C, Cr, V	No. 21
P			
Par-Exc	Special alloy	W, Cr	No. 68
Paragon Oil Hardening	Special alloy	Mn, V	No. 20
Park Silver	Carbon	C	No. 20
Pat. Cobaltcrom "PRK 33"	Special alloy	Co, Cr	No. 22
Pat. PRK 33 Cobaltcrom (Cast)	Special alloy	Cr, Co	No. 23
P. & B.	Carbon	C	No. 50
Peerless A.	Special alloy	W	No. 20
Peerless Extra	Carbon	C	No. 20
Penco	Carbon	C	No. 51
Planet Cold Rolled			No. 56
Planet Drill Rod	Carbon	C	No. 56
Planet High Speed	High speed	W	No. 56

Brand	Type	Determining Elements	Producer or Agent
Planet Special	Special alloy	V	No. 56
Poldi Brand 4	Carbon	C	No. 53
Poldi Brand 2002-ES	Special alloy, (oil and air hardening)	Cr, V	No. 53
Poldi CR	Special alloy (deep hardening, water quench)	Cr	No. 53
Poldi CV	Special alloy	Cr, V	No. 53
Poldi EZH	Carbon	C	No. 53
Poldi HPS	Special alloy	W	No. 53
Poldimaximum Special No. 55	High speed	Co	No. 53
Poldimaximum	High speed	W, Mo, V	No. 53
Poldi MK	High speed	Co	No. 53
Poldi SST	Special alloy	W	No. 53
Poldi Stabil	Non-deforming (oil hardening)	Mn, V	No. 53
Poldi Tenax	Special alloy	Cr, W	No. 53
Poldi 212	Special alloy	W	No. 53
Pompton	Carbon	C	No. 42
Prince	Special alloy	Cr	No. 46
PRK	Special alloy	Co, Cr	No. 71
Pure-Ore	Non-deforming (high Cr, high C)	Cr, C	No. 40
Pure-Ore Cobalt	High speed	W, Co	No. 40
Pure-Ore Cold Heading	Special alloy	V	No. 40
Pure-Ore Drill Rod	Carbon	C	No. 40
Pure-Ore High Speed	High speed	W	No. 40
Pure-Ore Special	Carbon	C	No. 40
Pure-Ore Special Alloy	Special alloy	W, Cr	No. 40
Purple Label	High speed	Co	No. 38
Pyro Tool	Special alloy		No. 30
Python	Special alloy	V	No. 42

R

Ramet	Cemented carbide	Tantalum carbide	No. 57
Record A	Special alloy	Cr, W	No. 44
Red Anchor	Carbon	C	No. 3
Red Anchor Drill Rod	Carbon	C	No. 3
Red Cut Cobalt	High speed	W, Co	No. 68
Red Cut Cobalt	High speed	W, Co	No. 15
Red Cut Superior	High speed	W	No. 68
Red Cut Superior	High speed	W	No. 15
Regal No. 2	Special alloy		No. 69
Regular	Carbon	C	No. 71
Regular Bolt Die	Special alloy	Cr	No. 45
Regular Tool	Carbon	C	No. 45
Red Label	High speed	Cr, W, V	No. 33
Red Label	Tungsten alloy	C	No. 2
Red Shadow	High speed	W, Cr, V	No. 71
Red Star Tool	Carbon	C	No. 15
Regular Tool	Carbon	C	No. 20
Rekord Extra	High speed	W, Co	No. 9
Rekord Superior	High speed	W	No. 9
Reliance	Carbon (drill rod)	C	No. 52
Reliance	Carbon (cold drawn)	C	No. 52
Renown	Special alloy	C, V	No. 41
Rex AAA	High speed		No. 20
Rex AA	High speed		No. 20
Rex A	High speed		No. 20
Rex 95	High speed		No. 20
Rita Alloy No. 7	Special alloy	Mn, Cr, Ni	No. 11
Rita Chrome-Vanadium	Special alloy	Cr, V	No. 11
Rita Cobalt High Speed	High speed	Co	No. 11
Rita Electric Tool	Carbon	C	No. 11
Rita Extra Special	Special alloy	W	No. 11
Rita Extra Tool	Carbon	C	No. 11
Rita High Speed	High speed	W, Cr, V	No. 11
Rita Hot Forging Die No. 1	Special alloy	W, Cr	No. 11
Rita Hot Forging Die No. 2	Special alloy	C, V	No. 11
Rita No-Change Oil Hardening	Special alloy	Mn	No. 11
Rita Special Tool	Carbon	C	No. 11
Rita Standard Drill Rod	Carbon	C	No. 11
Rita Standard Tool	Carbon	C	No. 11
Rita Three Point	Special alloy	W, Cr, Ni	No. 11
Rita Vanadium Drill Rod	Special alloy	Cr, V	No. 11
Royal Crown	Non-deforming (oil hardening)	Cr, W	No. 43
Ryolite B-F-D	Special alloy	Cr, W, V	No. 58
Ryolite Chromium Hot Work	Special alloy	Cr, V	No. 58
Ryolite Diamond B	Carbon	C	No. 58
Ryolite Tungsten Hot Work	Special alloy	W, Cr, V	No. 58
Ryolite X	Carbon	C	No. 58
Ryolite XX	Special alloy	V	No. 58
Ryolite XXX	Special alloy	V	No. 58
Ryolite 4-point Chisel	Special alloy	Si, Mn	No. 58

S

Sa-Best-Extra Standard	Carbon	C	No. 24
S. B. Steel	Special alloy	Cr	No. 20
Sandvik	Special alloy	C, Cr	No. 43
Saturn	Special alloy	C, W	No. 21
Seaco Extra	Carbon	C	No. 61
Seaco High Speed	High speed		No. 61
Seaco O. H. No. 4, Non-Shrink	Non-deforming	Cr, Mn	No. 61
Seaco Standard	Carbon	C	No. 61
Seaco Special	Carbon	C	No. 61
Seaco 70-20	Special alloy	V	No. 61
Section A. Auger	Carbon	C	No. 71
Section B. Auger	Carbon	C	No. 71
Self Hardening	Special alloy	Mo	No. 20
Self Hardening	Special alloy	W	No. 7
Seminole	Special alloy	Cr, W, V	No. 42
Silman	Special alloy	Si, Mn	No. 15
Simonds Diamond S.	Carbon	C	No. 60
Simonds Extra	Carbon	C	No. 60
Simonds Frontier	High speed	W	No. 60
Simonds Frontier Special	High speed	W, Co	No. 60
Simonds Non-Shrinking	Non-deforming	Mn	No. 60
Simonds T. A. S.	Special alloy	W, Cr	No. 60
Sisco	Special alloy		No. 63
SKF 1	Special alloy	C, Cr, Mn	No. 59
SKF 3	Special alloy	C, Cr	No. 59
SKF 3 Tubing	Special alloy	C, Cr	No. 59
SKF 6	Special alloy	C, Cr, Mn	No. 59
SKF 7	Special alloy	C, Cr	No. 59
SKF 9	Special alloy	C, Cr	No. 59
SKF 13	Special alloy	C, Cr	No. 59
SKF 22	Special alloy	C, Cr, Mo	No. 59
SKF 23	Special alloy	C, Cr, Mo	No. 59
SKF 36	Special alloy	C, Cr, V	No. 59
SKF 50	Non-deforming	C, Cr, W	No. 59
SKF 99	Special alloy	C, Cr	No. 59
SKF 100	Special alloy	Cr, W, V	No. 59
SKF 711	Special alloy	C, Cr, W, Si, V	No. 59
SKF Carbon	Carbon	C	No. 59
Soho Self-Hardening	Special alloy		No. 34
Solar	Special alloy	Si, Mo	No. 13
Special	Carbon	C	No. 69
Special (Water Hardening)	Carbon	C	No. 13
Special	Carbon	C	No. 30
Special	Carbon	C	No. 71
Special	Carbon	C	No. 41
Special	Carbon	C	No. 16
Special	High speed	W	No. 38
Special	Carbon	C, V	No. 68
Special	Special alloy	V	No. 10
Special	Carbon	C	No. 21
Special Bolt Die	Special alloy	W	No. 45
Special Chrome-Nickel	Special alloy	Cr, Ni	No. 44
Special Chrome-Vanadium	Special alloy	Cr	No. 2
Special D	Special alloy	W	No. 33-A
Special K	Special alloy	C, Cr	No. 35
Special Oil-Hardening	Non-deforming	Mn	No. 38
Special Punch	Special alloy	Si, C	No. 45
Special Shell Turning	High speed		No. 20
Special Tool	Carbon	C	No. 20
Special Tool	Carbon	C	No. 45
Special Vanadium	Special alloy	V	No. 39
Special Vanadium	Special alloy		No. 30
Special Very Hard	Special alloy	W	No. 35
Special No. 18	Special alloy	Cr, W	No. 9
Special No. 18	Special alloy	Cr, W	No. 51
Special No. 19	Special alloy	W	No. 9
Special No. 20	Special alloy	Cr, W	No. 9
Special Van	Special alloy		No. 69
Standard	Carbon	C	No. 30
Standard	Carbon	C	No. 16
Standard	Carbon	C	No. 10
Standard	Carbon	C	No. 41
Standard	Carbon	C	No. 21
Standard (Water Hardening)	Carbon	C	No. 9
Star Zenith	High speed	W	No. 13
Stellite No. 3	Hard alloy	Co, Cr, W	No. 32
Stentor	Non-deforming	Mn	No. 13
Sterling Nitrard No. 1	Nitrided		No. 28
Strauss Metal	Cemented carbide	Tungsten carbides	No. 71
Superior	Carbon	C	No. 44

Brand	Type	Determining Elements	Producer or Agent
Super Cesco Diamond	Special alloy	Si, Mn, Mo, V	No. 19
Super Chrome	Special alloy	Cr	No. 7
Superdie (High C, Cr)	Special alloy	C, Cr	No. 16
Super-Dreadnought	High speed		No. 30
Superior	Special alloy		No. 10
Superior Ark	High speed	W	No. 37
Superior Oil Hardening	Non-deforming		No. 37
Super Steel	High speed		No. 69
Super Rapid Extra	High speed	W	No. 35
Super-Panther	High speed	Cr, W, V, Co	No. 42
Supremus	High speed	W	No. 38
Swedish Vanadium	Special alloy	V	No. 43
Swedesteel A	Carbon	C	No. 49
Swedesteel B	Special alloy	Mo	No. 49
Swedesteel C	Special alloy	Cr, Ni	No. 49
Swedesteel D	Special alloy	V	No. 49
Swedesteel E	Special alloy	W	No. 49
Swed-Oil	Non-deforming	Cr, W	No. 40
S No. 4	Special alloy	Cr, W, Mo	No. 44
S-No. 2	Non-deforming	Cr, W	No. 44

T

Tack Die	Special alloy	W, Cr	No. 20
T Alloy	Special alloy	W	No. 10
Tennessee Special	Carbon	C	No. 65
Thermo Die	Special alloy		No. 30
Three Star High Speed	High speed	W, V, Co	No. 45
Tiger	High speed	W	No. 6
Timken Special Carbon	Carbon	C	No. 64
TI-TEX	Cemented Carbide		No. 55
Titus	Special alloy	C, Cr, V	No. 21
T-K Alloy	Special alloy	W	No. 13
Triangle X	Carbon	C	No. 66
Triple Alloy Punch	Special alloy	Cr, V, W	No. 20
Toledo Extra	Carbon	C	No. 4
Toledo High Speed	High speed	W	No. 4
Toledo (Non-Shrinking)	Non-deforming		No. 4
Toledo Scimitar	Special alloy	W, Cr	No. 4
Toledo Special	Carbon	C	No. 4
Toledo Superior	Carbon	C	No. 4
Tool Holder	High speed	W, Cr	No. 45
Tool	Carbon	C	No. 36
Top Notch	Special alloy	W	No. 38
TRI-MO	Special alloy	Cr, Mo	No. 66
Tri-Mo	Special alloy (air hardening)	Cr, Mo	No. 1
Triple Express A	High speed	W, Co	No. 33-A
Triple Express B	High speed	W, Co	No. 33-A
Tri-Van	Special alloy (oil hardening)	Cr, V	No. 1
Truform	Non-deforming	Mn	No. 38
Tungo	Special alloy	W	No. 15
Twinvan	High speed		No. 10
Two Star High Speed	High speed	W, V	No. 45

U

UB Crown	Carbon	C	No. 66
UB-46 Crown	Special alloy (oil-hardening)	Mn, Cr, W	No. 66
UHB	Carbon	C	No. 1
UHB Header	Carbon	C	No. 51
UHB Special	Non-deforming (oil hardening)	W, Cr	No. 1
UHB Super	Special alloy	Mo, W	No. 1
UHB 46	Non-deforming	Cr, W, Mn	No. 1
Ultra Capital	High speed	W, V	No. 1
Ultradie	Non-deforming (oil hardening)	C, Cr, V	No. 21
Unico	Special alloy	W	No. 33-A
Unito Drill Rod	Carbon	C	No. 39
Utica	Non-deforming (oil hardening)	Cr, W, V	No. 42

V

Vanadium	Special alloy	Cr, V	No. 68
Vanadium Crucible	Special alloy	C, V	No. 44
Van Die Car	Special alloy	Cr, C, V	No. 71
Velvet	Special alloy	W	No. 8
Very Best (water hardening)	Special alloy	Cr, V	No. 9
Very Best	Carbon	C	No. 6
Vibro	Special alloy		No. 10
V High Speed	High speed	Cr, W	No. 44
Vinco	High speed		No. 10
Visto Superior	High speed	W	No. 33-A

W

Wando	Non-deforming (oil hardening)	C, Mn, Cr, V, W	No. 21
Waterdie	Special alloy	Cr	No. 16
Washington	Carbon	C	No. 38
Weldo	Carbon	C	No. 33-A
Whelco Die and Tool	Special alloy	Cr	No. 70
Whelco Finishing	Special alloy	W	No. 70
Whelco Hot Work	Special alloy	W	No. 70
Whelco Oil-Hardening	Non-deforming	Mn	No. 70
Whelco Piston	Special alloy	Cr, V	No. 70
Whelco Standard	Carbon	C	No. 70
Whelco Superior	Carbon	C	No. 70
White Label	Carbon	C	No. 33
White Label	Non-deforming (air hardening)	C, Cr	No. 51
WIDIA	Cemented carbide	Tungsten carbide (usually)	No. 55
Wizard	Special alloy	W, Cr, Mo	No. 71
Woco	Special alloy	W	No. 6
Wolfram High Speed	High speed		No. 69
Wolva	Special alloy	C, W, Cr	No. 41
Wortle Die	Special alloy	W, Cr	No. 20

X

X. L. Chisel	Special alloy	C, W, Cr, V	No. 41
XX Superior	Special alloy	Cr	No. 8

Y

Yellow Label	Non-deforming (oil hardening)	Mn, Cr, W	No. 51
Yellow Label	Carbon	C	No. 33
Yellow Label Cast (Very best)	Carbon	C	No. 37

Z

Zip	High speed	Co (high), W	No. 71
ZIVCO	Carbon	C	No. 71
ZIV'S Block Tested Hollow Drill	Carbon	C	No. 71
Ziv's Cobalt	High speed	Co, W	No. 71
Ziv's Solid Drill	Carbon	C	No. 71
Ziv's Super	High speed	W, Cr, V	No. 71
OOO	Carbon	C	No. 66
OOO	Carbon (double extra)	C	No. 1
183 Mix	Special alloy	Ni, V	No. 20
2B	Special alloy	W	No. 30
3C	Special alloy	Cr, Co	No. 38
812	Non-deforming	C, Cr	No. 28
821-826	Special alloy	C, V	No. 24
999	High speed	Co	No. 34

Tool Steels by Types and Applications

CARBON	APPLICATIONS	PRODUCER or AGENT
A		
Acorn (Drill Steel)	Drills	No. 63
Acorn (Water Hardening)	Tools	No. 63
Ajax Drill Rod		No. 39
Andard	Drill steel	No. 26
Asco	Tools	No. 3A
Arrow Special	Tools and dies	No. 18
B		
B. D. Tool		No. 20
Balfosteel	Punches, dies, reamers and saws	No. 1
Best	Tools, taps, reamers, etc.	No. 36
Best	Taps, chisels, cutters	No. 6
Best (Water Hardening)	Dies, tools, etc.	No. 9
Bethlehem XCL		No. 5
Bethlehem XX		No. 5
Bethlehem XXX Special		No. 5
B-F Tool		No. 8
Black Diamond Drill	Cutters, drills, dies & hammers	No. 20
Black Label Cast (Extra)	Tools and dies	No. 37
Blue Anchor Drill Rod	Taps, drills, reamers, etc.	No. 3
Blue Label	Tools and dies	No. 51
Blue Label	General purposes	No. 33
Borite	Drills	No. 62

CARBON	APPLICATIONS	PRODUCER or AGENT
C		
Carbo	Chisels	No. 6
Carbomang (Cast) (Mn)	Tools, dies and machinery parts	No. 23
Carbon	Chisels, etc.	No. 25
Cast Composite	Blanking dies	No. 2
C. E. M.	Tools	No. 41
Chippaway	Tools, chisels	No. 38
Class P	Punches and dies, engraved dies, trimming and cutting dies, etc.	No. 2
Colonial Special No. 14	General purposes	No. 15
Comet (Water Hardening)	Taps, reamers, dies for blanking, trimming, forming, cold heading	No. 13
Composite	Dies	No. 7
Composite Die	Dies	No. 37
Crane (Water Hardening)	Cold chisels	No. 9
Crasco Green Label	Tools and dies	No. 17
Crasco White Label	Tools and dies	No. 17
Crusca New Process Hollow Drill		No. 20
D		
Deo	Chisels	No. 7
Dukane Drill Rod	Small tools and parts	No. 52
Dukane Cold Drawn	Small tools and parts	No. 52
Durabil	Tools and dies	No. 26
Duro (Double High Carbon)	Roll turning tools, dies for drawing brass tubing	No. 44
Dutrax	Tools and dies	No. 26
Dynamo	Tools, etc.	No. 50
E		
Excel Hollow Drill	Rock drills	No. 15
Extra		No. 69
Extra	Forming dies, shear blades	No. 71
Extra	Tools	No. 41
Extra		No. 10
Extra	Shear blades, cold chisels, etc.	No. 16
Extra		No. 8
Extra	Tools and dies	No. 21
Extra (Water Hardening)	Taps, reamers, drills, dies for blanking, trimming, forming, cold heading, etc.	No. 13
Extra Best	Tools, taps, reamers, etc.	No. 36
Extra Quality	Punch and die and general tool work	No. 35
Extra Special	Finishing tools	No. 36
Extra Special		No. 8
Extra Special	Cold trimming dies, punches, blanking dies	No. 30
Extra Tool	Cutters, drills, broaches, dies, etc.	No. 20
Extra Tool	Tools, dies and parts	No. 45
Extra Warranted	Dies, taps, reamers	No. 30
F		
First Quality	Punch and die and general tool work	No. 35
Fort Pitt		No. 69
FJAB Extra	General tool and die	No. 46
FJAB Hollow Drill	Mining, quarrying, construction work	No. 46
FJAB Regular	General tool and die	No. 46
FJAB Rolled Auger	Mining soft ores, anthracite coal, etc.	No. 46
FJAB Solid Drill	Mining, quarrying, construction work	No. 46
FJAB Special	Special die work	No. 46
Folder Die	Brake dies and forming tools	No. 44
Frasse Tempers A. B. and C		No. 29
G		
Gibraltar	Dies	No. 7
Gralur	Drill steel	No. 26
Green Label	Chisels, punches, etc.	No. 38
Green Label Cast (Special)	Tools and dies	No. 37
H		
Hack Saw		No. 37
Hawk Brand		No. 31
Hawk Special		No. 31
Hollo	Rock drills	No. 33-A

CARBON	APPLICATIONS	PRODUCER or AGENT
I		
Invincible Drill Rod		No. 36
J		
JC/C	General purposes	No. 27
K		
Kronos		No. 29
L		
La Belle Eagle	Cutters, drills, dies and hammers	No. 20
Latrobe	General purposes	No. 68
Lion	General Tools	No. 38
M		
MACCO Certified (Water Hardening)	General purposes	No. 43
McInnes Special (High Carbon)	Small tools for deep hardening	No. 44
Milo	Flogging and contractor's tools, scarifier picks	No. 33-A
Misco A	Chisels and track tools	No. 44
Misco B	Chisels	No. 44
Monaca Drill Rod	Small tools and parts	No. 52
Monaca Cold Drawn	Small tools and parts	No. 52
P		
P & B	Tools, etc.	No. 50
Park Silver	Cutters, drills, broaches, dies, etc.	No. 20
Peerless Extra		No. 20
Penco	Tools and dies	No. 51
Planet Drill Rod	Drill rods	No. 56
Poldi Brand 4	General tools, cold work dies, stamps, punches	No. 53
Poldi EZH	General shop tools, cold work dies, stamps, punches	No. 53
Pompton	Tools and dies	No. 42
Pure-Ore Drill Rod	Taps, twist drills, reamers, punches	No. 40
Pure-Ore Special	Dies and special tools	No. 40
R		
Red Anchor		No. 3
Red Anchor Drill Rod	Anvils, dental tools, spindles, precision shafts for motors	No. 8
Regular	Granite points, cold sets	No. 71
Regular Tool	Tools, dies and parts	No. 45
Red Star Tool	General purposes	No. 15
Regular Tool	Cutters, drills, broaches, dies, etc.	No. 20
Reliance Drill Rod	Small tools and parts	No. 52
Reliance Cold Drawn	Small tools and parts	No. 52
Rita Electric Tool	Tools, rock drills, chisels, etc.	No. 11
Rita Extra Tool	Taps, dies, punches, etc.	No. 11
Rita Special Tool	Taps, dies, punches, etc.	No. 11
Rita Standard Drill Rod	Taps, reamers, punches, pins, etc.	No. 11
Rita Standard Tool	Tools, rock drills, die blocks	No. 11
Ryolite Diamond B.	Crowbars, sledges, etc.	No. 58
Ryolite X	Blacksmiths tools	No. 58
S		
Sa-Best-Extra Standard	Tools, dies	No. 24
Seaco Extra	Chisels, rock drills, tools, etc.	No. 61
Seaco Standard	Chisels, rock drills, etc.	No. 61
Seaco Special	Tools and dies	No. 61
Section A. Auger	Mining drills	No. 71
Section B. Auger	Mining drills	No. 71
Simonds Diamond S.	Cutting tools	No. 60
Simonds Extra	Cutting tools, keen edge	No. 60
SKF Carbon	Stamping, cold heading, trimming dies.	No. 59

CARBON	APPLICATIONS	PRODUCER or AGENT
Special		No. 69
Special (Water Hardening)	Taps, reamers, drills, dies for blanking, trimming, forming, cold heading, etc., jigs and fixtures	No. 13
Special	Taps, dies and reamers	No. 30
Special	Taps, reamers, etc.	No. 71
Special	General tools	No. 41
Special	Dies, punches, taps, etc.	No. 16
Special	Tools and dies	No. 21
Special (V)	General purposes	No. 68
Special Tool	Cutters, drills, broaches, dies, etc.	No. 20
Special Tool	Tools, dies and parts	No. 45
Standard	Punches and dies	No. 30
Standard	Mandrels, forming rolls, hammers, etc.	No. 16
Standard		No. 10
Standard	General tools	No. 41
Standard	Tools and dies	No. 21
Standard (Water Hardening)		No. 9
Superior	General tools, dies and shear blades	No. 44
Swedesteel A	Rock drills and concrete busters	No. 49
T		
Tennessee Special	General uses	No. 65
Timken Special		No. 64
Triangle X	Rock drill pistons, etc.	No. 66
Toledo Extra		No. 4
Toledo Special		No. 4
Toledo Superior		No. 4
Tool	Drills, chisels, crowbars, etc.	No. 36
U		
UB Crown	Cold heading dies, stamping dies and punches	No. 66
UHB	Dies for cold heading, embossing, trimming and swedging	No. 1
UHB Header	Cold heading dies	No. 51
Unito Drill Rod		No. 39
V		
Very Best	Cutting tools	No. 6
W		
Washington	General tools	No. 38
Weldo	Re-steeling picks, etc.	No. 33-A
Whelco Standard		No. 70
Whelco Superior		No. 70
White Label	General blacksmith tools	No. 33
Y		
Yellow Label	Dies, tools	No. 33
Yellow Label Cast (Very Best)	Tools and dies	No. 37
Z		
Zivco	Sledges, pick points	No. 71
Ziv's Block Tested Hollow Drill	Mining drills	No. 71
Ziv's Solid Drill	Mining drills	No. 71
OOO	Dies and punches	No. 66
OOO (Double Extra C)	Intricate tools, broaches, drawing and threading dies	No. 1

HIGH-SPEED

HIGH-SPEED	APPLICATIONS	PRODUCER or AGENT
A		
Albion Special High Speed		No. 34
Arrow High Speed (W)	Tools and dies	No. 18
B		
Baltoc (Cobalt)	Hogging tools for heavy cuts	No. 30
Bethlehem Comokut High Speed (Co, Cr, W, V)	Turning, planing, drilling, tapping	No. 5
Bethlehem Special (Cr, W, V) (High Speed)	Turning, planing, drilling, tapping, reaming, etc.	No. 5
B-F High Speed		No. 8
Blue Chip	Cutting tools	No. 28
Bonded Carbide		No. 10
B-6 (C, Cr, W, V)	Lathe tools, bits, cutters, drills, reamers, etc.	No. 21
B-7 (C, Cr, W, V, Co)	Lathe tools, bits, cutters, drills, reamers, etc.	No. 21
B-9 (C, Cr, W, V, Mo)	Lathe tools, bits, cutters, drills, reamers, etc.	No. 21
C		
Champion	Cutters, drills, broaches, dies, etc.	No. 20
Circle C	Cutting tools, etc.	No. 28
Clarite (Cr, W, V)	Cutting tools	No. 16
Cobalt High Speed (Cr, W, Co)	Cutters, tools and dies	No. 44
D		
Darwin 505 (Co, W, V)	Turning tools	No. 22
Dreadnought		No. 30
Duranmium (W)	Tools and dies	No. 26
E		
Electrite Cobalt (C, W, Cr, V, Co)	Cutting tools	No. 41
Electrite Super Cobalt (C, W, Cr, V, Co)	Cutting tools	No. 41
Electrite Ultra Cobalt (C, W, Cr, V, Co)	Cutting tools	No. 41
Electrite Uranium (C, W, Cr, V)	Cutting tools	No. 41
Electrite Vanadium (C, W, Cr, V)	Cutting tools	No. 41
Electrite No. 1 (C, W, Cr, V)	Cutting tools	No. 41
G		
Gold Anchor	Chasers, dies, punches and special tools	No. 3
Gold Anchor Drill Rod	Twist drills, reamers, punches, small tools, etc.	No. 3
Gold Label (Cr, W, V, Co)	Cutting tools	No. 33
Gold Star (W, Co)	Cutting tools	No. 13
I		
Imperial Major (W)	Lathe and planing tools, etc.	No. 2
K		
Kutkwik (C, Cr, W, V)	Cutting tools	No. 24
L		
L-XX High Speed (Cr, W, V)	Cutting tools	No. 42
M		
Maximum (W)		No. 29
Maxite (Cr, W, V, Co)	Cutting tools	No. 16
MoTung (Mo, W)	Cutting tools	No. 67
N		
New Rapid (W)	Punch and die and cutting tools	No. 35
Novo Special (W, Cr)	Lathe tools, etc.	No. 7
Novo Superior (W, Cr)	Lathe tools, etc.	No. 7
O		
One Star High Speed (W, V)	Cutting tools	No. 45
Onplus (W, Cr, V)	Cutting tools	No. 48
P		
Planet High Speed (W)	Cutting tools	No. 56
Poldimaximum Special No. 55 (Co)	Cutting tools	No. 53
Poldimaximum (W, Mo, V)	Cutting tools	No. 53
Poldi MK (Co)	Cutting tools	No. 53
Pure-Ore Cobalt (W, Co)	Special tools	No. 40
Pure-Ore High Speed (W)	Special tools	No. 40
Purple Label (Co)	Turning tools	No. 38
R		
Red Cut Cobalt (W, Co)	Cutting tools	No. 68
Red Cut Cobalt (W, Co)	Lathe tools	No. 15
Red Cut Superior (W)	Cutting tools	No. 68
Red Cut Superior (W)	Lathe tools	No. 15
Red Label (Cr, W, V)	Cutting tools	No. 33
Red Shadow (W, Cr, V)	Cutting tools	No. 71
Rekord Extra (W, Co)	Dies, tools	No. 9
Rekord Superior (W)	Dies, tools	No. 9
Rex AAA	Cutters, drills, broaches, dies, etc.	No. 20
Rex AA	Cutters, drills, broaches, dies, etc.	No. 20

HIGH-SPEED	APPLICATIONS	PRODUCER or AGENT
Rex A	Cutters, drills, broaches, dies, etc.	No. 20
Rex 95	Cutters, drills, broaches, dies, etc.	No. 20
Rita Cobalt High Speed (Co)	Cutting tools	No. 11
Rita High Speed (W, Cr, V)	Cutting tools	No. 11
S		
Seaco High Speed	Cutting tools	No. 61
Simonds Frontier (W)	Cutting tools	No. 60
Simonds Frontier Special (W, Co)	Heavy duty high speed tools	No. 60
Special (W)	Drilling tools	No. 38
Special Shell Turning		No. 20
Star Zenith (W)	Cutting tools	No. 13
Super-Dreadnought		No. 30
Superior Ark (W)		No. 37
Super Steel		No. 69
Super Rapid Extra (W)	Punch and die and cutting tools	No. 35
Super-Panther (Cr, W, V, Co)	Cutting tools	No. 42
Supremus (W)	Planer tools	No. 38
T		
Three Star High Speed (W, V, Co)	Cutting tools	No. 45
Tiger (W)	Cutting tools	No. 6
Toledo High Speed (W)		No. 4
Tool Holder (W, Cr)	Cutting tools	No. 45
Triple Express A (W, Co)	High speed lathe tools, twist drills, reamers, etc.	No. 33-A
Triple Express B (W, Co)	High speed lathe tools, twist drills, reamers, etc	No. 33-A
Twinvan		No. 10
Two Star High Speed (W, V)	Cutting tools	No. 45
U		
Ultra Capital (W, V)	Turning tools, cutters, etc.	No. 1
V		
V High Speed (Cr, W)	Cutters, tools and dies	No. 44
Vinco		No. 10
Visto Superior (W)	High speed lathe tools, twist drills, reamers, etc.	No. 33-A
W		
Wolfram High Speed		No. 69
Z		
Zip (Co High, W)	Cutting tools	No. 71
Ziv's Cobalt (Co, W)	Cutting tools	No. 71
Ziv's Super (W, Cr, V)	Cutting tools	No. 71
999 (Cobalt)	Hogging cuts at fast speeds	No. 30
Hard alloys		
J-Metal (Co, Cr, W)	Milling, boring, reaming tools	No. 32
Stellite No. 3 (Co, Cr, W)	Cutting tools	No. 32

SPECIAL ALLOY	APPLICATIONS	PRODUCER or AGENT
A		
A. B. C. (W, Cr)	Tools	No. 22
Air hardening		No. 8
Airdi (C, Cr, V, Mo)	Forming and crimping rolls, perforating dies and plug gages, etc.	No. 20
Ajax (C, Cr, V)	Hot work dies	No. 21
Albany (Cr, V)	Tools	No. 42
Albor Die	Die steel for hard metals	No. 37
Alco (C, Cr, V, W)	Chisels	No. 21
Alloy C	Tools and dies	No. 37
Alloy finishing		No. 10
Alpha (W)	Chisels and dies	No. 45
Alva Extra (V)	Blanking, forming, threading dies, taps, etc.	No. 20
Alva Special (V)	Blanking, forming, threading dies, taps, etc.	No. 20
Apollo (C, Cr, V)	Die casting dies	No. 21
Atha Pneu (Cr, W, V)	Pneumatic chisels, rivet busters, etc.	No. 20
Atha Rim Roll (Cr)	Forming rolls	No. 20
Atlas No. 93 (Cr, Mo)	Dies	No. 42
Atlantic 33 (Cr, Mn, Mo)	Shock tools	No. 4B
B		
Bethlehem Finishing (W)	Fast finishing	No. 5
Bethlehem No. 57 Hot Work (Cr, W)	Severe hot work application	No. 5
Bethlehem No. 445 Hot Work (Cr)	Bolt dies	No. 5
Bethlehem Omega (Si, Mn, Mo)	Chisels, punches	No. 5
Black Label (Cr, V)	Tools and dies	No. 51
B. M. S. (W)	Chisels, hard punches, shear blades	No. 33-A
B. N. D. (Cr)	Gripper dies	No. 7
Brown Label (Cr)	Hot work	No. 33
Bush Hammer (V)		No. 20
Buster Brand (Cr, W)	Chisels and other shock resisting tools, shear blades	No. 16
B-4 (C, Cr, V, W)	Hot work dies	No. 21
C		
C. C. S. Die (Cr, W, Si)	Die casting work	No. 20
Calo Ferro	Hot work	No. 69
Castaloy (Cast) (Cr)	Pressed metal dies	No. 23
Champion Extra (W)	Cutters, drills, broaches, dies, etc.	No. 20
Champion Non-Changeable (Mn, Cr, W)	Stamping dies, taps, reamers, etc.	No. 20
Checkno (W)		No. 6
Chiz-Alloy (Cr, W, Mo)	Hand and pneumatic chisels	No. 40
Choice (Cr)	Hot work dies	No. 68
Chrome Die (Cr)	Hot work	No. 42
Chrome-Vanadium		No. 10
Colhed (V)	Cold heading dies	No. 68
Colonial No. 7 (V)	Dies	No. 15
Colosso (W)	Flogging and pneumatic tools, rivet sets	No. 33-A
Crasco Red Label (Mn, W, Cr)	Tools and dies	No. 17
Crasco Black Label (C, Cr)	Tools and dies	No. 17
Crasco Special Vanadium (V)	Tools and dies	No. 17
Crescent Hot Work No. 2 (Cr)	Gripper and header dies, etc.	No. 20
Crescent Special Alloy (Cr, W, V)		No. 20
Crocar (Cr)	Dies	No. 68
Cromo (Cr, Mo)	Chisels, bulldozers, etc.	No. 6
Cromva (Cr, V)	Die casting dies	No. 6
Crusca V. J. Special (W)	Twist drills, cutting and blanking dies, etc.	No. 20
Crusca V. J. Extra (W)	Twist drills, cutting and blanking dies, etc.	No. 20
Crow (Cr)	Tools	No. 42
D		
Dense Steel (Cr, Si, Mo)	Punches, chisels, etc.	No. 20
Diamond (Cr)	Dies	No. 45
Diamonite (W)	Cutting tools for steel	No. 18
Double Special (W)	Cutting tools	No. 20
Double Seven (Cr)	Shear blades, cold press work, etc.	No. 2
Double Special	Finishing tools	No. 30
Double Special (W)	Fast finishing steel	No. 16
Draco (C, V)	Tools and dies	No. 21
Dualoy (W)	Chisels and tools	No. 26
Dukex (W)	Chisels and tools	No. 26
Dumost (V)		No. 8
Duredge (W)	Chisels	No. 62
Duvan (V)	Die steel	No. 26
E		
Elhanco (C, V)		No. 30A
E. S. A. (C, W, Cr, V)	Finishing tools	No. 41
Excelo (W)	Hot work dies	No. 13
Extra Chrome (Cr)	Hot work	No. 69
Extra Punch (C, W, Cr, V)	Punches and dies	No. 41
E. Z. 14 W. (W)	Hot dies, tools	No. 9
F		
Firex (Ni, Cr)	Shock-resisting and hot shears	No. 22
Fool-Proof (Cr, W)	Chisels (hand and pneumatic)	No. 43
G		
Grade H (W)		No. 29
Green Label (C, W)	Fast finishing broaches	No. 51
Gripmore (Cr)	Hot blanking and forming dies	No. 6
H		
H. Y. C. C. (C, Cr, V)	Forming and crimping rolls, perforating dies and plug gages, etc.	No. 20

SPECIAL ALLOY	APPLICATIONS	PRODUCER or AGENT
Hack Saw (W)		No. 20
Hack Saw (W)		No. 37
Halco	Hot work dies	No. 30
Haicut	Chisels, shear blades, hot work	No. 30
Haldi (Air Hardening)	Dies	No. 30
Hawk H. (Cr, V)		No. 31
Hawk Vanadium (V)		No. 31
Headmore (Cr, V)	Header dies	No. 6
Hecla		No. 69
Hidalgo (W)	Pneumatic and flogging tools, shear blades, dies, punches, rivet sets	No. 33-A
Hi-Pro		No. 69
Hollow Bar (Cr)	Dies	No. 43
Hot die No. 2 (Cr)	Hot work dies	No. 10
Hot Header No. 3 (W)	Hot work	No. 15
Huron (Oil Hardening) (Cr, V)	Dies	No. 42
Hypro No. 62 (C, Cr)		No. 9

I

Ideor (Low carbon) (W, Cr)	Chisels	No. 22
Imperial (W)	Turning, planing, drilling and fine finishing cuts	No. 2
Intra (W)	Dies, reamers, etc.	No. 7

J

J-4 Chisel	Chisels	No. 37
J. S. Steel (W)	Chisels and punches	No. 28

K

K (C, Cr, W)	Hot work dies, punches	No. 21
K D 6 (W, Co)	High speed lathe tools, twist drills, reamers, etc.	No. 33-A
K D 10 (W, Co)	High speed lathe tools, twist drills, reamers, etc.	No. 33-A
Keystone (C, Cr, W, V)	Chisels	No. 24
Keystone		No. 10
KR		No. 69
Kinite (Cr)	Drawing dies and blanking	No. 7
K-R Alloy (Cr)	Hot work dies	No. 13
Kromax (High C, High Cr)	Dies	No. 43
Krovan	Jewelers dies	No. 30
K-W (W)	Draw dies	No. 13

L

La Belle Special Hot Die (Cr, Ni)	Hot heading dies	No. 20
La Belle No. 89 Die (Cr, V, Mo)		No. 20
La Belle C & H (Ni, Cr, V)	Chipper knives	No. 20
La Belle Semi-Hot (Cr, W, V)	Hot work	No. 20
La Belle Silicon Punch No. 2 (Cr, Si, Mn, Mo)	Punches, chisels, etc.	No. 20
La Belle Silicon Punch No. 1 (Cr, Si, Mn)	Punches, chisels, etc.	No. 20
La Belle 2-70 (Si, Mn)	Punches, chisels, etc.	No. 20
La Belle No. 211 Die (Ni, Cr, Mo)	Hot work	No. 20
La Belle No. 24 Die (C, Cr, V, Mo)	Forming and crimping rolls, perforating dies, plug gages, etc.	No. 20
Liberty	Broaches, reamers, dies	No. 30
Lophos (C, V)	Cold heading dies	No. 71

M

Magic	Chisels and track tools	No. 38
Marathon	Dies	No. 30
Martin (Cast) (Cr)	Pressed metal dies	No. 23
Marvel (W)	Hot work dies	No. 68
Maxtack (C)	Tack knives and dies, and headers	No. 2
Midvaloy No. 77 (Cr, Mo)	Dies and taps	No. 45
Minerva Special (W)	Pneumatic chisels, cold chisels, rivet busters, flogging chisels, etc.	No. 2
Mohawk Hot Die (Cr, W, V)	Hot work	No. 42
M Y (Cr, Si)	Pneumatic tools, etc.	No. 35
M Y Extra (W, Cr, Si)	Pneumatic tools, etc.	No. 35

N

NEOR (C, Cr)	Dies	No. 71
Nonshrink (W, Cr)	Dies	No. 6
No. 4 Hot Die (Cr)	Gripper dies, hot nut piercers, cutoffs and hot press work	No. 2
No. 5 Hot Die (W)	Pressing and squeezing dies, also extrusion operations	No. 2

SPECIAL ALLOY	APPLICATIONS	PRODUCER or AGENT

O

Ontario (Air-Hardening) (Cr, Mo, V)	Dies	No. 42
Orange Label (Cr, W)	Chisels, punches and rivet sets	No. 33
Orion (C, Cr, V)	Machine parts	No. 21

P

Par-Exc (W, Cr)	Punches and chisels	No. 68
Paragon Oil Hardening (Mn, V)	Stamping dies, taps, reamers, etc.	No. 20
Pat. Cobaltcrom PRK 33 (Co, Cr)	Press tools, aeroplane-valves, etc.	No. 22
Pat. PRK 33 Cobaltcrom (Cast) (Cr, Co)	Pressed metal dies	No. 23
Peerless A. (W)	Hot heading and forging dies, etc.	No. 20
Planet Special (V)	Dies	No. 56
Poldi Brand 2002-ES (Oil and Air Hardening) (Cr, V)	Highly stressed tools subject to abrasive wear	No. 53
Poldi CR (Deep Hardening Water Quench) (Cr)	Dies, punches, cold rolls	No. 53
Poldi CV (Cr, V)	Die casting dies	No. 53
Poldi HPS (W)	Tools for hot work	No. 53
Poldi SST (W)	Taps, dies, punches and shop tools	No. 53
Poldi Tenax (Cr, W)	Hot and cold work tools, punches, chisels, dies	No. 53
Poldi 212 (W)	Hot work tools	No. 53
Prince (Cr)	Ballbearing	No. 46
PRK (Co, Cr)	Dies	No. 71
Pure-Ore Cold Heading (V)	Header dies	No. 40
Pure-Ore Special Alloy (W, Cr)	Broaching, stamping white gold, etc.	No. 40
Pyro Tool	Hot and cold work impact tools	No. 30
Python (V)	Tools and dies	No. 42

R

Record A (Cr, W)	Hot work	No. 49
Regal No. 2	Finishing	No. 64
Regular Bolt Die (Cr)	Hot work dies	No. 45
Red Label (C)	Taps, cutters and drawing dies	No. 2
Renown (C, V)	Stamping dies, fine edged tools	No. 41
Rita Alloy No. 7 (Mn, Cr, Ni)	Pipe taps and dies, cutter wheels, vise jaws, spindles, etc.	No. 11
Rita Chrome-Vanadium (Cr, V)		No. 11
Rita Extra Special (W)	Finishing tools, drawing dies	No. 11
Rita Hot Forging Die No. 1 (W, Cr)	Hot work tools	No. 11
Rita Hot Forging Die No. 2 (C, V)	Hot work tools	No. 11
Rita No-Change Oil Hardening (Mn)	Taps, reamers, punches, dies, etc.	No. 11
Rita Three Point (W, Cr, Ni)	Long run cutting dies	No. 11
Rita Vanadium Drill Rod (Cr, V)	Pins (dowel and ejector)	No. 11
Ryolite B-F-D (Cr, W, V)	Dies, gages, etc.	No. 58
Ryolite Chromium Hot Work (Cr, V)	Hot heading dies, hot shearing, etc.	No. 58
Ryolite Tungsten Hot Work (W, Cr, V)	Hot heading dies, hot shearing, etc.	No. 58
Ryolite XX (V)	Lathe centers, shear blades, etc.	No. 58
Ryolite XXX (V)	Dies, turning tools, etc.	No. 58
Ryolite 4-point Chisel (Si, Mn)	Hand tools	No. 58

S

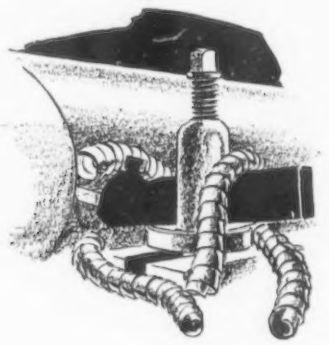
S. B. Steel (Cr)		No. 20
Sandvik (C, Cr)	Tempered and annealed springs, saws, tapes and rules	No. 43
Saturn (C, W)	Finishing, drawing dies	No. 21
Seaco 70-20 (V)	Drills, tools, etc.	No. 61
Self Hardening (Mo)		No. 20
Self Hardening (W)	tap dies	No. 7
SKF 1 (C, Cr, Mn)	Ball bearings, rollers, spindles	No. 59
SKF 3 (C, Cr)	Ball bearings, rollers, spindles	No. 59
SKF 3 Tubing (C, Cr)	Bearing races, bushings	No. 59
SKF 6 (C, Cr, Mn)	Ball bearings, rollers, spindles	No. 59
SKF 7 (C, Cr)	Balls, rollers, spindles	No. 59
SKF 9 (C, Cr)	Balls, rollers, spindles	No. 59
SKF 13 (C, Cr)	Balls, rollers, spindles	No. 59
SKF 22 (C, Cr, Mo)	Trimming and stamping dies, drills	No. 59
SKF 23 (C, Cr, Mo)	Trimming and stamping dies, drills	No. 59
SKF 36 (C, Cr, V)	Trimming, blanking and forming dies, gages, brass-turning tools	No. 59

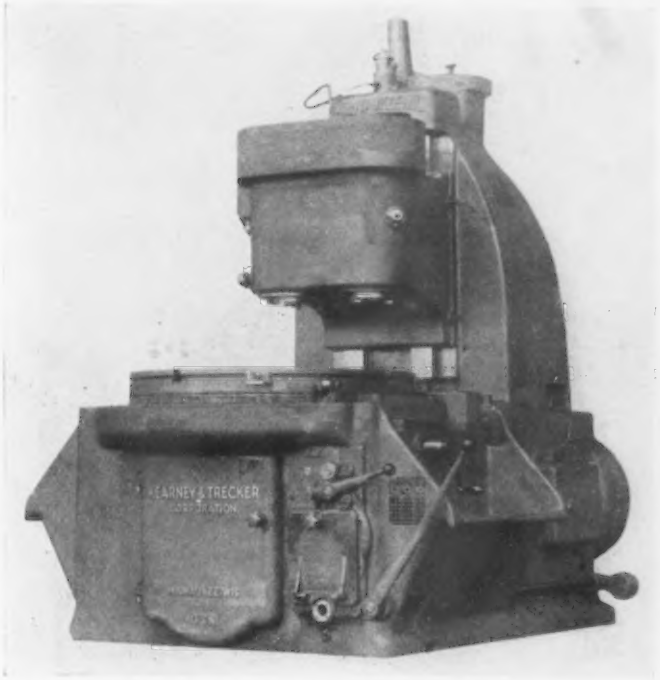
SPECIAL ALLOY	APPLICATIONS	PRODUCER or AGENT
SKF 99 (C, Cr)	Hot heading	No. 59
SKF 100 (Cr, W, V)	Hot punching and piercing	No. 59
SKF 711 (C, Cr, W, Si, V)	Shearing punches, forging, chisels, broaches, blanking and forming dies	No. 59
Seminole (Cr, W, V)	Chisels and impact tools	No. 42
Silman (Si, Mn)	Shock tools	No. 15
Simonds, T. A. S. (W, Cr)	Shear blades, heavy duty cutters and dies	No. 60
Sisco		No. 63
Soho (Self Hardening)		No. 34
Solar (Si, Mo)	Chisels, rivet sets, etc.	No. 13
Special (V)		No. 10
Special Bolt Die (W)	Hot work dies	No. 45
Special Chrome Nickel (Cr, Ni)	Hot work	No. 44
Special Chrome Vanadium(Cr)	Rivet sets and dies, hot punch and die work, thread rolling dies, high duty shafts, etc.	No. 2
Special D (W)	Hot dies	No. 33-A
Special K (C, Cr)	Punch and die work	No. 35
Special Punch (Si, C)	Punches	No. 45
Special Vanadium (V)		No. 39
Special Vanadium	Dies, cold punches, impact tools	No. 30
Special Very Hard (W)	Fast finishing	No. 35
Special No. 18 (Cr, W)	Pneumatic tools and shear blades	No. 9
Special No. 18 (Cr, W)	Chisels, rivet sets	No. 51
Special No. 19 (W)	Taps	No. 9
Special No. 20 (Cr, W)	Finishing tools	No. 9
Special Van		No. 69
Super Cesco Diamond (Si, Mn, Mo, V)	Chisels, concrete busters, drills, caulking and beading tools	No. 19
Super Chrome (Cr)	Drawing dies and blanking	No. 7
Superdie (High-Carbon, High-Chrome)	Blanking dies, etc.	No. 16
Superior		No. 10
Swedish Vanadium (V)	Tools and dies	No. 43
Swedesteel B (Mo)	Scarifier teeth and chisel blanks	No. 49
Swedesteel C. (Cr, Ni)	Shovel teeth	No. 49
Swedesteel D. (V)	Digging bars	No. 49
Swedesteel E. (W)	Tool bits	No. 49
S No. 4 (Cr, W, Mo)	Rivet sets, shear blades, pneumatic tools	No. 44
T		
Tack Die (W, Cr)		No. 20
T Alloy (W)		No. 10
Thermo Die	Hot work dies, die casting dies	No. 30
Titus (C, Cr, V)	Punches and chisels	No. 21
T-K Alloy (W)	Hot work dies	No. 13
Triple Alloy Punch (Cr, V, W)	Punches	No. 20
Toledo Scimitar		No. 4
Top Notch (W)	Chisels and track tools	No. 38
TRI-MO (Cr, Mo)		No. 66
Tri-Mo (Air-Hardening) (Cr, Mo)	Heavy dies for severe requirements	No. 1
Tri-Van (Oil-Hardening) (Cr, V)	Blanking dies, coining dies	No. 1
Tungo (W)	Shock tools	No. 15
U		
UB-46 Crown (Oil-Hardening) (Mn, Cr, W)		No. 66
UHB Super (Mo, W)	Chisels	No. 1
Unico (W)	Pneumatic and flogging tools, shear blades, dies	No. 33-A
V		
Vanadium (Cr, V)	Dies, punches, shear blades, shafts	No. 68
Vanadium Crucible (C, V)	Dies, shear blades, cold heading dies	No. 44
Van Die Car (Cr, C, V)	Dies	No. 71
Velvet (W)		No. 8
Very Best (Water Hardening) (Cr, V)	Dies, tools	No. 9
Vibro		No. 10
W		
Waterdie (Cr)	Large forming rolls, bearings	No. 16
Whelco Die and Tool (Cr)	Punches and dies	No. 70
Whelco Finishing (W)		No. 70
Whelco Hot Work (W)	Hot work dies	No. 70
Whelco Piston (Cr, V)	Pistons	No. 70
Wizard (W, Cr, Mo)	Pneumatic tools	No. 71
Woco (W)	Pneumatic and rivet-busting tools	No. 6
Wolva (C, W, Cr)	Punches, dies, reamers, etc.	No. 41
Wortle Die (W, Cr)	Drawing dies	No. 20

SPECIAL ALLOY	APPLICATIONS	PRODUCER or AGENT
X		
X. L. Chisel (C, W, Cr, V)	Chisels	No. 41
XX Superior (Cr)		No. 8
2B (W)	Hot die work	No. 38
3C (Cr, Co)	Cold work dies	No. 38
183 Mix (Ni, V)	Keen edge dies, machine knives	No. 20
821-826 (C, V)	Tools	No. 24
NON-DEFORMING		
A		
AMCOH Special (Mn, Cr, W)	Die work	No. 46
Arrestite		No. 8
Arrow Oil-Hardening (W, Mn)	Dies, tools	No. 9
B		
Bethlehem Lehigh Die and Tool (High C, High Cr)	Intricate punches and dies	No. 5
Bethlehem Tool Room, Oil-Hardening (Mn)	Intricate punches and dies	No. 5
C		
Cello Vanadium (Cr)	Milling cutters, dies, taps, master tools	No. 44
Chrome B 15 (Cr)	Cold and threading dies, punches, stamps	No. 33-A
Colonial Six, Oil-Hardening (Mn)	Dies	No. 15
Constant (Mn, W)		No. 45
D		
Deward Oil-Hardening (Mn, Mo)	Dies	No. 42
Dixi 3 (Cr)	Staybolt taps, large and small reamers, master dies	No. 33-A
Double Six Die (C, Cr)	Blanking, coining, cutting, drawing and thread rolling	No. 2
E		
Extra M G (Mn)		No. 35
G		
Gray Label (Mn, Cr)	Precision files and tools	No. 33
Griffin (Cr, Mn)	Dies and punches, thread rolling tools	No. 1
G. S. N. (C, Cr)	Stamping and forming dies	No. 41
G. S. N. Special (C, Cr)	Stamping and forming dies	No. 41
H		
H (C, V)	Dies	No. 22
Hampden (C, Cr)	Dies	No. 13
Hardrite		No. 69
Hargus (C, Cr, Mn)	Dies	No. 71
Hypro (Cr)	Punches, dies and forming rolls	No. 6
Hobson-Non-Shrink		No. 34
K		
K-9 Oil-Hardening (Mn)	Dies, taps, reamers, plugs, gages, etc.	No. 2
Ketos (Oil-Hardening)	Dies, taps and reamers	No. 30
Kiski		No. 10
M		
Mangano (C, Mn)	Stamping dies	No. 41
Mansil (C, Mn, V)	Dies	No. 24
Master (Mn)	Tools and dies	No. 26
N		
NEOR (High Carbon) (Cr)	Dies	No. 22
Non-Shrinkable		No. 69
Non-Shrinkable (Mn)	Dies	No. 68
Normar (C, Cr, Mn)	Dies	No. 71
North Star (W)	Dies	No. 62
O		
Oildie (Cr)	Blanking, piercing dies	No. 16
P		
Poldi Stabil (Oil-Hardening) (Mn, V)	Dies and shop tools	No. 53
Pure-Ore (High Cr, High C)	Intricate dies	No. 40

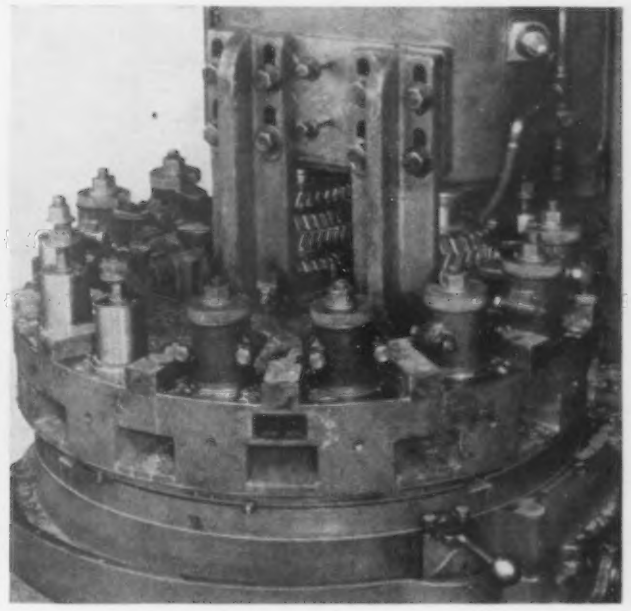
NON-DEFORMING	APPLICATIONS	PRODUCER or AGENT
R		
Royal Crown (Oil-Hardening) (Cr, W)	Dies	No. 43
S		
Seaco O. H. No. 4 Non-Shrink (Cr, Mn)	Dies	No. 61
Simonds Non-Shrinking (Mn)	Dies	No. 60
SKF 50 (C, Cr, W)	Blanking and molding dies, gages, cutters, broaches	No. 59
Special Oil-Hardening (Mn)	Press tools and dies	No. 38
Stentor (Mn)	Dies	No. 13
Superior Oil-Hardening	Tools and dies	No. 37
Swed-Oil (Cr, W)	Dies and tools	No. 40
S-No. 2 (Cr, W)	Milling cutters, dies, taps, master tools	No. 44
T		
Toledo (Non-Shrinking)		No. 4
Truform (Mn)	Press tools and dies	No. 38
U		
UHB Special (Oil-Hardening) (Cr, W)	Blanking and forming dies, etc.	No. 1
UHB 46 (Cr, W, Mn)	Intricate blanking and forming dies. Thread dies	No. 1
Ultradie (Oil-Hardening) (C, Cr, V)	Dies, gages, etc.	No. 21
Utica (Oil-Hardening) (Cr, W, V)	Tools and dies	No. 42
W		
Wando (Oil-Hardening) (C, Mn, Cr, V, W)	Dies, gages, etc.	No. 21
Whelco Oil-Hardening (Mn)		No. 70
White Label (Air-Hardening) (C, Cr)	Tools and dies	No. 51
Y		
Yellow Label (Oil-Hardening) (Mn, Cr, W)	Tools and dies	No. 51
812 (C, Cr)	Dies	No. 24

CEMENTED CARBIDES	APPLICATIONS	PRODUCER or AGENT
Carboloy (Tantalum or Tungsten Carbide)	Cutting tools	No. 12
Firthaloy	Drawing and extrusion dies	No. 28
Firthite	Cutting tools	No. 28
Ramet (Tantalum Carbide)	Cutting tools, wire dies	No. 57
Strauss Metal (Tungsten Carbides)	Cutting tools	No. 71
TI-TEX	Cutting tools for steel	No. 55
WIDIA (Tungsten Carbide usually)	Cutting tools of all kinds	No. 55
UNCLASSIFIED		
Annite (Cast)	Blanking dies	No. 6
Armide (Carbide Alloy)	Cutting tools	No. 4-A
C. C. S. Die (Hot work)	Die casting dies	No. 30
Cromovan (Triple Die)	Dies	No. 28
Fedol (Oil-Hardening)	Tools	No. 63
Hobson's Choice XX		No. 34
Hobson Warranted Best		No. 34
Kloster Hollow Drill	Rock drills	No. 40
Krupp	All types tools, steels	No. 55
L. C. T. Alloy	Hot work dies, etc.	No. 30
L. L. C. T.	Hot work dies, etc.	No. 30
Planet Cold Rolled		No. 56
Sterling Nitrard No. 1	Drawing and extrusion dies	No. 28





The close-up view below shows the rotary-type vertical miller arranged for straddle milling forged steel spring seats. The cutters on one spindle rough mill the faces and the others finish them



Rotary-Type Vertical Miller Built to Use Carbide and Other Cutters

FOR high-production manufacturing purposes, the Kearney & Trecker Corpn., Milwaukee, has developed the Mil-waukee-Mill rotary-type vertical miller illustrated, which, it is stated, has the strength, rigidity, high speeds and fast feeds necessary for the application of cemented carbide cutters, as well as cutters made from other materials. Such operations as face, side and straddle milling, slotting, form cutting, and the finishing of radial faces may be done on this machine.

An outstanding feature is the worm drive to the table. The table is 36 in. in diameter and is driven by a heavy wormwheel, almost equal in size, which is mounted solidly on the bottom side. Eighteen table feed changes are available through pickoff gears. Changes are made at the feed-change box located conveniently at the front of the machine next to the control levers. A table feed ratio of 40 to 1 is provided so that the full benefits of tungsten carbide are obtainable, even where the cut is light, or where the material being machined is soft, such as aluminum, and unusually fast feeds are desirable.

The table has two feed rates, one the normal feed and the other power rapid traverse. The table can be fed at the selected feed rate through the cut, then it can be engaged into rapid traverses at the rate of 240 in. per min. to the next station, after which the normal feed is again engaged.

Table control is by means of two levers—the one at the right adjacent to the table is for directional control, and the one at the front of the bed is for selecting the table movement, either feed or power rapid traverse. By means of a crank at the end of the bed, the table may be moved in either direction by hand.

Either a single or double-spindle head can be furnished. One of the spindles of the two-spindle head illustrated is mounted in a quill and has ample adjustment to compensate for cutter wear. Special heads with one or more spindles in any position or combination can also be furnished.

Speed changes for the head are by means of pickoff gears located in the box at the top of the upright. Spindle speeds are furnished in any one of four optional ranges of 15 to 150; 20 to 200; 30 to 300; or 50 to 500. There are 18 speed changes to each range. The spindle and other control levers are grouped at the normal loading position, as shown.

The capacity of the machine is as follows: Vertical adjustment of spindle, 10 in.; maximum and minimum distance face of spindle to top of table, 14 in. and 4 in.; cross adjustment of head, 8½ in.; and maximum and minimum distance centerline of table to centerline of spindle, 16½ in. and 8 in. respectively.

The machine bed contains two large reservoirs, one for the cutter coolant and one for lubricating oil. The entire machine is automatically lubricated. A sight gage at the top of the upright indicates that the lubrication system is working properly. The oil level sight gage is located below the feed box at front of the machine.

Application of the machine to the milling of forged steel spring seats is illustrated. The cut constitutes the straddle milling of two bosses; the cutters mounted on the spindle at the right, rough these faces and the others finish them. The work fixture holds 14 pieces. The pieces first are placed on the plugs, then C-washers are put on, after which the nuts are tightened securely. Rotation of the table is continuous. The operator loads and unloads at the front of the fixture, while the pieces at the rear are being milled. Production averages 65 pieces per hour. For this set-up outer supports for the arbors are mounted on the two-spindle head.

To Make Overhead Handling Equipment

The Osborn Mfg. Co., Cleveland, maker of foundry molding machines, sand treating and sand and mold handling equipment, and industrial brushes, has established a materials handling division for the manufacture of tramrail systems. This equipment, said to include several unusual features making for safe and rapid overhead transportation of materials, will be built in capacities up to 3 tons. J. B. Forker, Jr., is sales manager of the new division and is also in charge of design. R. W. Hisey, secretary of the company, is in charge of production.

Special Five-Way Drill for V-Type Cylinder Block

A SPECIAL five-way multiple-spindle drilling machine, having one vertical head and two upper and two lower angular heads and a total of 90 spindles, has been built recently by the Foote-Burt Co., Cleveland, for the drilling of a V-type cylinder block. The machine is of unit-type construction, each drilling unit, with individual motor drive, being complete within itself.

The heads are driven by drum-type cam units, the vertical heads and two angular heads having 14-in. diameter cams and the two lower units having 10-in. diameter cams. Cam units with 6-in. and 16-in. diameter cams can also be furnished. The ways for the drilling heads are wide and the slides are long. All units are driven by standard foot mounted ball-bearing motors, so that the motors are interchangeable whether they are used on vertical, horizontal or angular ways. All heads and cam units have individual lubricating systems, with sight-feed gages to show the oil level.

Operation is simple, one throw-in lever serving to actuate all drilling units. One fixture-clamping lever clamps and locates the part and also moves the guide bushings in close to the work with a single operation. The throw-in lever which, due to improved design, works very easily, starts the operating cycle of all units simultaneously. Each unit continues through its cycle and returns to the starting point, where it remains until the machine is unloaded and reloaded and the throw-in lever is again operated. Each head is individually adjustable on the ways to compensate for drill grinding, this adjustment being made by means of a crank which is applied to squared shafts located within easy reach of the operator.

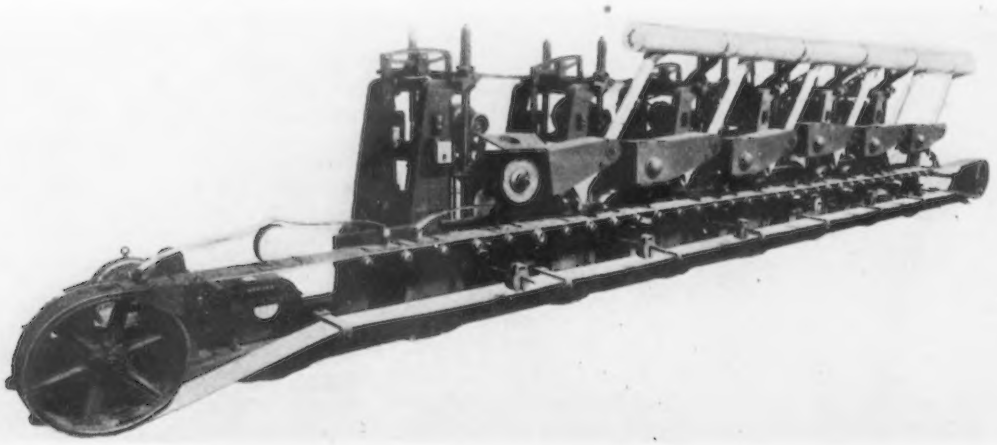
Improved Automatic Bumper Polishing Machine

TO meet the demand for a straight-in-line automatic polishing machine adapted for automobile bumpers having a wide oval or a corrugated face and higher curves, the Excelsior Tool & Machine Co., East St. Louis, Ill., is offering the improved unit here shown. The higher curves of the bumpers of newer design necessitate more lift and space between the conveyor belt and polishing wheels.

Ten-wheel straight-in-line automatic grinding and polishing machines of this type were brought out by the company several years ago for the grinding and polishing of electric iron base castings and for other parts; later they were adapted to the polishing of automobile bumpers.

In addition to providing for a 12-in. wheel rise, the present machine, the No. 29, is of heavier construction than the previous models and has heads spaced farther apart. The dust suction system has been markedly improved and is of greater capacity. Each wheel unit is equipped with a 10-hp. motor which drives the spindle through grooved pulleys and six V-belts. Heavy balance weights prevent the polishing wheels from bouncing up or down the curves. Other improvements include double dust spouts that reduce the dust hazard and use of ball bearings on all equalizing connections.

Production capacity of the 14-wheel machine ranges from 1000 to 2000 bars per day, depending upon the size and shape of the bumper. The floor space required for a six-wheel machine is 6 ft. x 48 ft.; the weight of this machine is about 25,000 lb.



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IN addition to heavier construction, this new straight in-line automatic bumper polishing machine has a wheel rise of 12 in., heads spaced farther apart than previously, and a markedly improved dust suction system.

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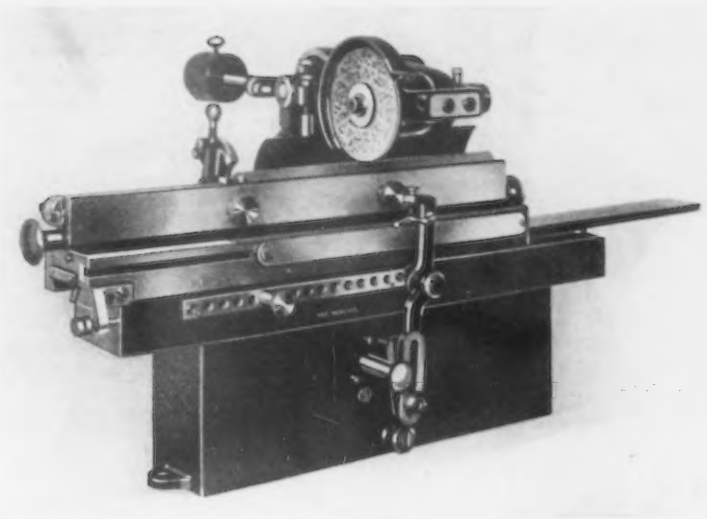
Machine Reclaims High-Speed Hacksaw Blades



HIGH-SPEED and carbon steel machine hacksaw blades are said to be reclaimed at a cost of 10 per cent of a new blade by the "Elenel" automatic machine illustrated, which is built by the L. & L. Mfg. Co., 56 Springdale Avenue, East Orange, N. J. In addition, it is stated that in this process the teeth are ground true, 90 deg. with the sides, and have a correct "backing off" on the cutting face, so that each sharpened tooth will cut evenly and not cause sidewise binding of the blade due to wrong face position. The machine will not burn, anneal or in any other way injure the hardness of the teeth. A blade can be reclaimed four or five times if the "set" is not destroyed. The machine is designed for bench use, and its enclosed 1/16-hp. repulsion induction driving motor is arranged for connection with any lighting circuit. It will reclaim blades ranging from 8 to 21 in. in length, ⅝ to 1½ in. in width and with from 2 to 14 teeth to an inch.

Mounted on a frame as shown, the grinding wheel swings alternately to and away from the saw blade, sharpening a tooth at each contact with the blade. The blade is not clamped tightly; it has a slight up and down movement, which is emphasized as simulating the "human touch," and longer contact at each down movement of the grinding wheel. As the wheel swings upward, the blade holder is caused to index the distance of one tooth space. Both the movement of the wheel frame and the indexing of the blade holder are cam actuated. The indexing mechanism includes a pawl that engages the teeth of a master hacksaw blade mounted on the front of the work table below the blade-holding device as shown.

The sharpening operation is automatic. When all the teeth have been reclaimed, the operator lifts the indexing pawl and pushes the table to the right against a stop that can be adjusted to suit different lengths of blade. He then unloads and loads the work table, and pulls out a knob at the front of the machine, which, by engaging the feed clutch, starts the grinding operation again.

The saw blade is free to float longitudinally and vertically so that it can position itself relative to the wheel, and thus compensate for any inaccuracies in the blade teeth. Missing saw teeth do not interfere with proper grinding and indexing, and bowed or distorted blades present no difficulty because the blade by its floating arrangement compensates itself to the grinding wheel at each tooth position.

Downward movement of the grinding wheel frame is cushioned by a hydraulic resister, which can be adjusted to meet conditions; and while the vertical movement of the grinding wheel frame is always the same, it can be adjusted quickly to different positions to suit various blade widths. Several dozen blades can be sharpened at one truing of the wheel. Special grinding wheels are furnished. A diamond holder can be applied to the wheel frame. The machine is 28 in. long, 15 in. wide and 17 in. high. It weighs 240 lb.

Hammer Machines Used on Axle Housings

ONE of a battery of special hammering machines built recently by the Langelier Mfg. Co., Providence, R. I., for use on automobile rear axle housings after the two pressed steel halves have been welded together is shown in the illustration.

The machine hammers the section at the end of the housing to which is attached the spring perch. After welding, the parts are oversize and out of round, and instead of turning an excessive amount of metal, thereby decreasing the strength at this point, the hammering reduces the diameter of the tube, increases the wall thickness in doing so, and makes it round and to size within limits of 0.002 in.

Construction of the machine is similar to that of a swaging unit. The main spindle, driven by the flywheel, carries six rolls which strike a roll in the oscillating plunger that is made to receive the upper die. Spindle rotation is at 300 r.p.m., and 1800 blows a minute are struck on the work. The lower die is operated through a toggle joint from a hydraulic cylinder by a variable-delivery high-pressure motor driven pump. The rotating mechanism is equipped with an air-operated collet type chuck and air tailstock, the drive being from a speed reducer belted from the flywheel. Floor space of 72 x 105 in. is required. The machine weighs approximately 4 tons.

▲ ▲ ▲

(At top of page) If the "set" is not destroyed, hacksaw blades can be reclaimed four or five times on this automatic machine

❖ ❖ ❖

(At right) Special hammering machine used on automobile rear axle housings after the two pressed steel halves have been welded together

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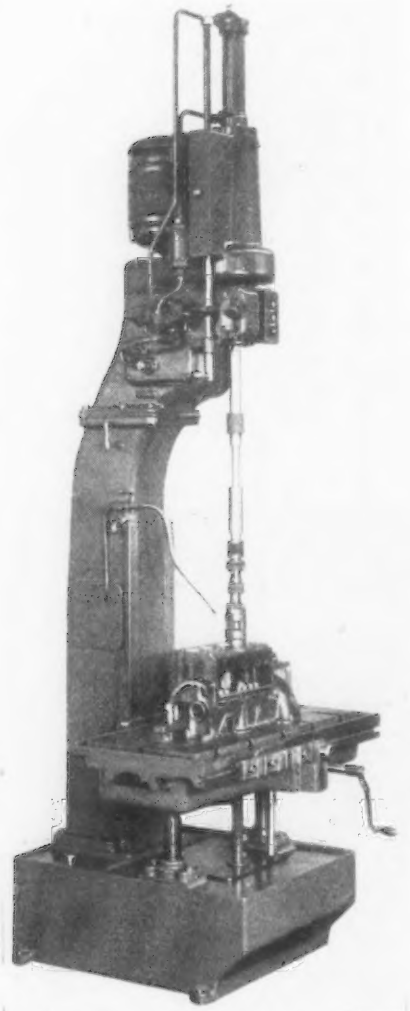
Honing and Lapping Machine for Light Work

FOR a limited range of light work, the Barnes Drill Co., Rockford, Ill., is offering the No. 194 single-spindle hydraulically reciprocated honing and lapping machine illustrated. This single speed machine has capacity for honing all diameters from 4 in. down to ¾ in. and lapping bores smaller than ¾ in. The maximum stroke is 8 in. and the minimum, ½ in.

The machine embodies the company's self-oiling all-geared construction, and has anti-friction bearings throughout. The six-splined spindle and its telescopic sleeve extension are made of chrome-nickel steel, heat treated and hardened, and all gears are of alloy steel, heat treated. The six splined spindle is driven by six splined hub running on two Timken roller bearings. The machine is furnished geared to any one speed of spindle rotation desired and the hydraulic control is adjusted for one rate of spindle feed or reciprocations, both rotations and reciprocations being figured for the particular job.



The machine is adapted for lapping small bushings, etc., as well as for honing automobile cylinders

To facilitate lift-out the spindle is equipped with telescoping extension sleeve. This sleeve has approximately 5 in. of travel and may be locked at the upper position for holding the hone out of the work and locked at the lower position to properly locate hone in the cylinder and hold in the extended position during the working stroke.

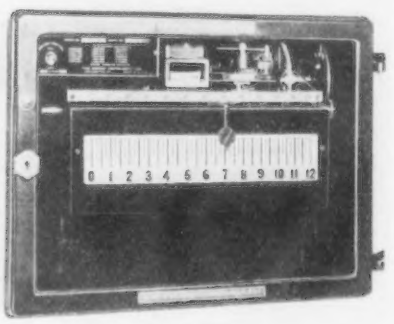
For honing cast iron, hone rotation is at approximately 250 to 300 ft. per min., the stroke feed being about 50 lineal ft. per min.

The base contains compartments for coolant reservoir and filter. The coolant pump is mounted in the column and is shaft driven. The top of the base has covers for compartments and two crosswise finished bosses upon which fixture may be mounted if a table is not supplied. Fixtures are furnished extra, and a solid box type table of proper height, or raising screw type of table, can be furnished. A table with lateral travel and indexing control is also obtainable as an extra.

A 2-hp. 1800-r.p.m. ball-bearing motor drive arranged for vertical application is recommended; push-button switch with inching button should be used for convenience in starting, inching, and stopping machine. The floor space, front to back, is 34 x 28 in., and the extreme height of the regular machine is 112¾ in. The net weight, with motor and starter and rectangular raising screw table is 1140 lb.

Self-Balancing Indicating Potentiometer

A NEW indicating potentiometer of the self-balancing type has been added to the line of the Brown Instrument Co., Philadelphia. This is pointed to as an important advance in potentiometer design, since most indicating potentiometers hitherto have required hand balancing.



In addition to self balancing and other features, the instrument has an unusually long slide wire

Aside from this main design feature, the new potentiometer offers other advantages. Among these are an unusually long (40-in.) slide wire, positive spiral shaft drive, a non-slip clutch, a secondary pointer definitely fixing the size of step in moving the slide wire contact, interchangeable case for universal mounting, mechanism swings out of case for easy inspection without interference with operation, mercury-in-glass switches in control models, automatic thermal equalization between cold junction terminals and compensation coil, and many other construction and operating advantages of interest and value to potentiometer users.

A feature is the big scale with large figures, calibration marks and pointer, making accurate reading easy at a considerable distance. As a pyrometer this instrument can be supplied for any range from 0 to 100 deg. F. up to 0 to 3000 deg. F., or for almost any span between these ranges. Models for automatically controlling as well as indicating temperatures can be furnished where specified.

Rigid Tool Bit and Cutting-Off Blade Holders

A TOOL BIT holder designed to grip the bit on four sides, one-third the length of a new standard bit, is being marketed by the Four Grip Tool Co., 107 East Seventeenth Street, Paterson, N. J. The bit is clamped rigidly in place by the action of a screw on a V-block, the latter being a round piece of steel with a vee cut into it the full length. It is claimed that with this arrangement the tool bit, even if short, cannot shift and that heavy cuts can be taken without danger of bit breakage.

Both the V-block and the set screw are made of alloy steel and are heat treated to provide maximum strength and prevent mushrooming and distortion. The clamping screw is offset,

The cutting-off tool is shown above and the straight shank type of tool below. The tool-bit is clamped rigidly in place by the action of a screw on a V-block

as shown, to permit clear view of the cutting point of the tool at all times.

Bits having Stellite or tungsten-carbide tips can be used, as well as those made of tool steels. Standard commercial bits are recommended; these even if they vary in size as much as 0.005 in. under or 0.015 in. over the nominal may be used without affecting the rigidity obtainable from the holder.

Of several types of this tool, the "Four-Grip" straight-shank type and the cutting-off tool are here illustrated. The latter is made in straight, right-hand and left-hand styles and in nine sizes. The blade is ground to an included angle to 60 deg. and is held firmly by means of the V-block and screw. Boring mill, planer and shaper tools incorporating the Four-Grip feature are also made.

New Source of Hydrogen and Nitrogen

HYDROGEN and nitrogen, or a mixture of these gases, are used in many industrial processes which demand a reducing or inert atmosphere. Some processes now employing such gases are atomic hydrogen welding, bright annealing of metals, reduction of metallic oxides, radio tube and lamp manufacture, nitrogen packed foodstuffs, lead burning, and many others. The method of producing hydrogen and nitrogen by "cracking" or dissociating anhydrous ammonia now offers industry a cheap and reliable source for obtaining these gases in an extremely pure state.

The illustration shows an electric ammonia dissociator developed by the Ajax Electric Co., Philadelphia. This apparatus yields a dry gas containing 75 per cent hydrogen and 25 per cent nitrogen. Due to the purity of the raw material (anhydrous ammonia) the gas produced is not contaminated with any hydrocarbons, oxygen, oil or sulphur. A standard cylinder of 100 lb. ammonia will yield 4500 cu. ft. of dissociated gas. Based on an ammonia cost of 16c. a lb., and power rate of 2c. per kwhr., the cost of the dissociated gas is $3.68 per 1000 cu. ft. in an average size unit. The Ajax Electric Co. is now offering these electric ammonia dissociators in the following standard sizes: 50, 150, 300 and 500 cu. ft. per hr. capacity.

Corrugated Pipe Made of Heavy Plates

FOR large drainage structures the Armco Culvert Manufacturers Association, Middletown, Ohio, has developed Armco Multi-Plate Pipe here shown. Manufactured in diameters ranging from 90 in. to 10 ft. and longer, this pipe is said to be a super-corrugated structure of balanced design made of plates heavier than ever before used in that type of construction. In appearance it resembles the usual corrugated pipe, except that the heavy plates are strengthened with larger corrugations, which are 6 in. from crest to crest and 1½ in. deep.

The plates, galvanized and corrugated in the factory, are rolled into circular segments, shipped nested and assembled in the field by being bolted together. In bolting, the circumferential joints are broken by staggering the plates so that a continuous pipe in any multiple of 5 ft. can be made without a circumferential seam. Plates are 10 ft. long, except that half of them are 5 ft. at each end. However, in the case of diameters requiring an odd number of plates the length is 7½ ft.

Economy is claimed for the new product, since heavy gage plates can be used in the bottom of the pipe where the greatest wear comes and lighter gage plates for the remainder of the periphery. The pipe is adapted to jacking, because of the method of construction which permits extension without the use of bands or matching holes for riveting. It is designed for large culvert jobs, bridge replacements, storm sewers and stream inclosures.

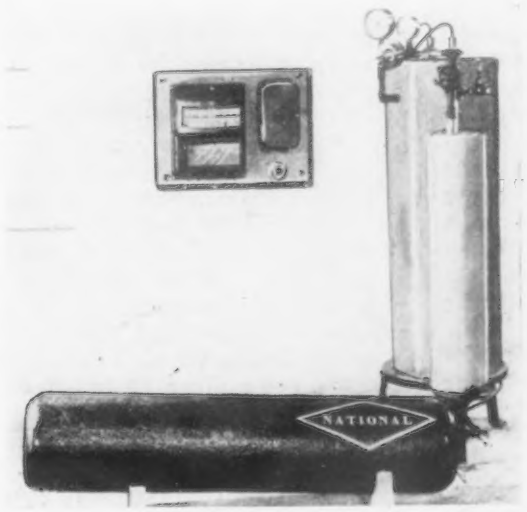
Air Filter Composed of Glass Wool

THE Dustop air filter, put on the market by the Owens-Illinois Glass Co., Toledo, is composed of a closely packed mass of fine twisted glass fibers in a paper container. The container has open grilled faces permitting free passage of air through the glass wool. The weight of a standard unit is 2 lb.

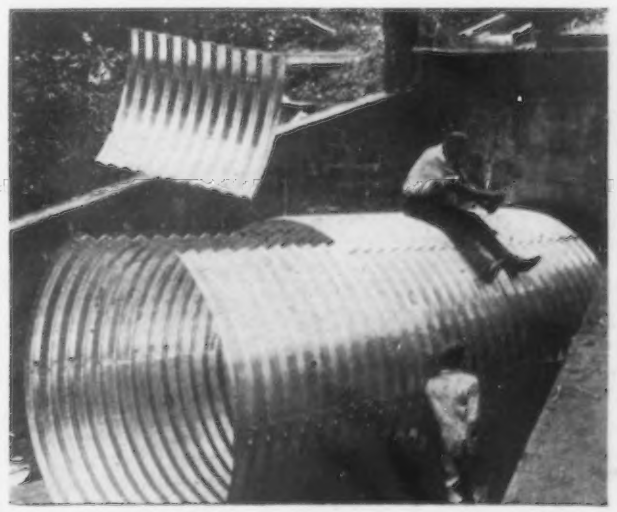
The glass wool is coated with an oily substance which picks up the dust particles from the air. The standard filters are 2 in. thick and are set up in pairs. In air-conditioning equipment in a large industrial plant they may be set up in banks on large steel frames at the intake side of the air duct where the air is drawn into the building by forced draft.

The filters are so low in price that they can be discarded when they approach saturation and be replaced with new units. Replacements can be made easily and quickly. It is pointed out that there is a sanitary advantage in having filters changed completely at frequent intervals. The flexible paper containers, it is said, insure an air-tight junction with the edges of the steel rack and are vibrationless and hence noiseless.

Subsidiary companies of the United States Steel Corpn. have contracted for exhibit space at the Century of Progress, Chicago, 1933.



This electric ammonia dissociator yields a dry gas containing 75 per cent hydrogen and 25 per cent nitrogen, a standard 100-lb. cylinder of ammonia yielding 4500 cu. ft. of the gas



The pipe is made of unusually heavy plates, which, galvanized and corrugated at the factory, are rolled into circular segments shipped nested and bolted together in the field, as shown

MONEY SAVING IDEAS

— 95 —

Electric Gages Speed Production

AN active routing department superintendent found a bottle neck in a certain production schedule at the inspection benches. The work in question was of a precision character and the usual go-and-no-go gages proved slow and subject to error unless checked constantly. He corrected this whole problem by installing electric gages which are vision read by means of flash signals. The operator merely inserts a piece in the gage jaws and if the piece is correct an amber light flashes; if it is undersized a green light appears and if over-sized the light is red.

— 96 —

Welds Cooled with Spray

A MANUFACTURER of electric-welded tubing was unable to combine the welding with a subsequent forming operation because the heat of the welded joint caused an irregularity in the flow of material. He overcame this difficulty by the simple means of installing a water spray to cool the tubing immediately after welding and previous to the forming.

— 97 —

Slant-Cut Saves Material

A SURPRISING saving in material has been made by a pistol manufacturer by buying bars, as far as possible, in lengths which are multiples of the lengths of pieces required in manufacture. Instead of cutting off the bars square as is customary, in certain cases they are cut off at an angle. The corners of two pieces are thus saved.

— 98 —

Saves by Moving a Press

AN excellent opportunity for saving often is to be found in the cut off department by combining a second operation with the cutting off operation without loss of time. A manufacturer of mower blades has successfully combined a punching operation with the operation which cuts the steel strip into the lengths required for the blades. Previously the strip was cut to length on a small power shears located close to the stockroom and the punching was done on a rugged punch press on the manufacturing floor above. The punch press was moved to the stockroom and the shearing operation was added, thus eliminating one complete operation with its separate handling and its separate operator's time.

— 99 —

Washes Windows: Turns Off Lights

NO good substitute for washing windows has yet been discovered and it seems a little surprising that designers of manufacturing plants have given this particular feature so little attention. The usual substitute is more artificial illumination. A manufacturer with a four story plant was using artificial light on all four floors. Recently he had the windows washed in his plant and now he finds that he does not need to turn on the electric lights on the top two floors. He figures that the saving in his light bills will pretty nearly offset the cost of washing the windows. Perhaps in addition to this the daylight may be a little better for the operators' eyes and also for their work.

— 100 —

Mechanical Dip for Hardening

A MANUFACTURER of wrenches has been able to maintain the proper toughness in the core of forgings and yet produce hard surface teeth by dipping the ends of the forgings for a short interval in a lead bath held accurately at 1400 deg. F. and then quenching and drawing in the usual manner. The lead dip on a small surface only is secured by mounting the wrenches in special jig holders which are fastened securely to a mechanical dipping arm above the bath.

— 101 —

Increases Machine Tool Capacity

MACHINE shop superintendents are not always alert to the production possibilities of their various tools. This is particularly true when they use modern cutting alloys which often increase the cutting capacity of a tool beyond the speed of its original design. One superintendent has set about to correct this by a general increase in speed throughout his shop. With drilling machines he has found it possible to fit larger pulleys on to the tools without otherwise altering them. In the case of lathes and other tools where he has found it difficult to use large pulleys he has used a second line shaft parallel to the existing one and operating at a higher speed and thus he has at his disposal two complete speed ranges, one when the tool is driven from the slow shaft and another when it is driven from the faster shaft.

FOR WORKS MANAGERS

— 102 —

Keeps Track of Material

THE inventory of stock in process of manufacture is usually difficult to secure. One clock manufacturer has solved the problem by having trays or tote boxes made in the exact size to take an even number of units, usually 50 or 100. He has made it a definite rule that all of these boxes in transit must be completely filled and in this way it is merely necessary to count the number of trays and the number of units may then be quickly figured. The trays are each marked on the front with the number of units so that the quantity contained in a stack of say 15 or 20 trays can be determined almost at a glance.

— 103 —

Uses Shears for Blanking

THE long established method of making tacks involves the reversing of a strip of steel so that a wedge shaped piece is first cut off in one direction and then in the other, thus using up all the metal without scrap. It is strange that this principle has not been used more extensively in general metal working processes. It has been adopted recently to advantage by a manufacturer of wrenches for cutting the blanks from which more or less wedge shaped forgings are made. The cutting shears are set at a permanent angle and the strip of proper width is first cut in one direction and then reversed and cut in the opposite direction. This is repeated until the strip is used up.

— 104 —

Lights Used to Control Temperature

WHERE accurate temperature must be maintained in a heat treating furnace the usual recording pyrometer is not always sufficient. To help avoid temperature changes one manufacturer has installed electric lights in front of each furnace. These are connected so that a red light appears if the temperature is too high and a white light if the temperature is too low. When the temperature is correct a small green light glows reassuringly.

— 105 —

Accurate Temperature for Pickling

A MANUFACTURER of turbine blades after considerable experimenting has found a successful method of pickling 5 per cent nickel steel. He immerses the blades for 15 min. in a solution of 50 per cent hydrochloric acid held accurately at 140 deg. F. Following this he dips the blades in a bath of pure nitric acid and then rinses them in warm water to recover the acid. In the case of small blades drying by tumbling with sawdust follows the rinsing.

— 106 —

Submerged Sprays for Quenching

DIFFICULTY in uniform quenching of heavy steel parts has annoyed many heat treating department managers. A large circulating system for the quenching liquid is one answer to the problem. One metallurgist instead of putting in such a system which is expensive for the small shop, has used a pump in direct connection with the quenching tank to produce submerged sprays which strike on all sides of the parts as they are lowered for quenching.

— 107 —

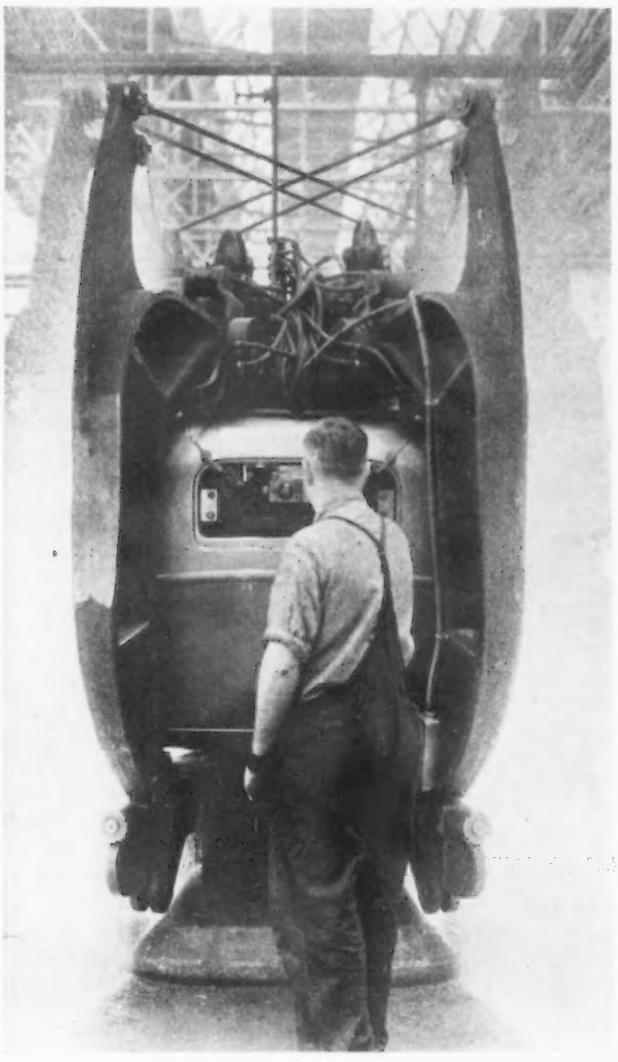
Uses Irregular Section Bars

MANUFACTURERS of small metal products will do well to examine carefully the sources of supplies and the many varieties of raw materials now available. Thus blanks for the first stamping operation may often be secured at a price which shows a saving when the cost of scrap and its handling is considered. Gear manufacturers can secure bars which have been extruded with gear shaped cross-section and which therefore have merely to be cut off into thin disks to produce the desired gears. A manufacturer of turbine blades has found an economy in buying specially shaped bars to replace the flat strip previously used. In this way be has eliminated a forging operation.

— 108 —

Prevents Loss of Small Tools

MANY manufacturers find that the loss of small tools from the tool room runs to a surprising total during the year. One manufacturer has successfully reduced this loss by using a posted list and issuing checks. Each operator who may need tools is issued each month ten or twenty checks or more depending upon his needs. He then gives the tool man one check in exchange for each tool taken out. A list is posted daily showing the tools charged against different check numbers and in this way each man may verify those for which he is responsible.



Welding Is a Major Manufacturing Process in Building the Ford Motor Car

By W. W. MACON

TWO fan-like showers of sparks between the two pairs of jaws of the welding machine climax the fusion of the body panels. ▲▲▲

WELDING has become an increasingly important tool in the manufacture of the Ford automobile. There are probably 2000 welds in a single car of the new V-8 type as against some 1700 in the car of model A. Outstanding in the general welding procedure is the provision of numerous special machines, many of them automatic or semi-automatic, all to give high output with minimum manual labor and low unit cost. Also especially noteworthy is an adaptation of the photoelectric tube for high frequency interruption of the welding current in the case of resistance seam welding, with a virtual doubling of the output over mechanical interruption of the current. A large amount of the welding done is by the flash resistance method but considerable spot welding also is in use and there is some arc welding by automatic machines.

Body Sheets Butt Welded

UNDOUBTEDLY the most spectacular machines are those for welding together in the one operation the back and right and left hand quarter panels of the two-door sedan. Each of these panels is an expanse of sheet steel completely formed, including the window frames. The machine welds the vertical junction between the sides of the car body and the end, comprising two lines of butt welding, each about 54 in. in length.

At each of the four welding machines of this type now in operation at the Rouge plant of the Ford Motor Co., the three sets of panels to be welded together are kept in steady supply by operators of adjacent machines doing minor jobs on the panels, such as assembling nut retainers in the quarter panels. Three men load and run each large machine. Each hangs the proper panel on a fixture mounted on the machine, which is adjustable to fit the window opening of the panel. The panels are promptly fastened in place by quick acting clamps and a pair of jaws are swung down over each of the two gaps to be welded. The jaws grip tightly the abutting edges of the sheets. A push button is pressed and the welding cycle is begun.

In a very brief period there is a pyrotechnic display of sparks shot fan like from the line of junction; the welding is promptly completed, the jaws are released and swung upward out of the way, the clamps are released and the complete metal tonneau is lifted away from the machine. Other operators then take the assembly to give it any necessary reinforcement by arc deposited metal at inside points. Then it is put on a conveyor for the progressive chipping of the flash and the grinding and polishing of the lines of welding by portable tools as it is moved from station to station on the conveyor.

Each of the body welding machines turns out 65 to 70 car bodies an hour. As indicated in an accompanying illustration, the three panels are welded in what may be termed their natural position. Each panel is easily hung into the machine, each man has a sequence of action to follow, and the three on removing the completed weld are ready to handle the next set of panels.

The operation of the machine is automatic. The pressing of the button starts a motor which, through a special Ford-constructed gear-reduction and under the control of automatic cams, brings the side panels up against the back panel, then switches on the electric transformers delivering the current. The flow of current across the gap quickly develops the

WELDING in making the new Ford automobile is highly mechanized. Special machines for quantity production feature the manufacturing equipment. Butt flash welding of the body sections, high-speed resistance seam welding under the automatic control of the photoelectric tube, automatic hydraulic manipulation of machine spot welding and machine arc welding are outstanding examples of the application of the welding processes to metal-working factory operations. Bar and gun welders, so called, have been evolved to expedite spot welding of assemblies.

welding temperature and when fusion conditions obtain, the current is shut off by the machine itself and the side panels are immediately forced against the back panel completing the weld, upsetting the metal and forming the flash.

Of the less than 60 seconds required for loading, welding and unloading the machine, only 8 sec. covers the welding cycle proper, that is, the time the machine is in operation, or from the movement of the side panels laterally to get the contact with the back panel to the shutting off of the current and the upsetting action.

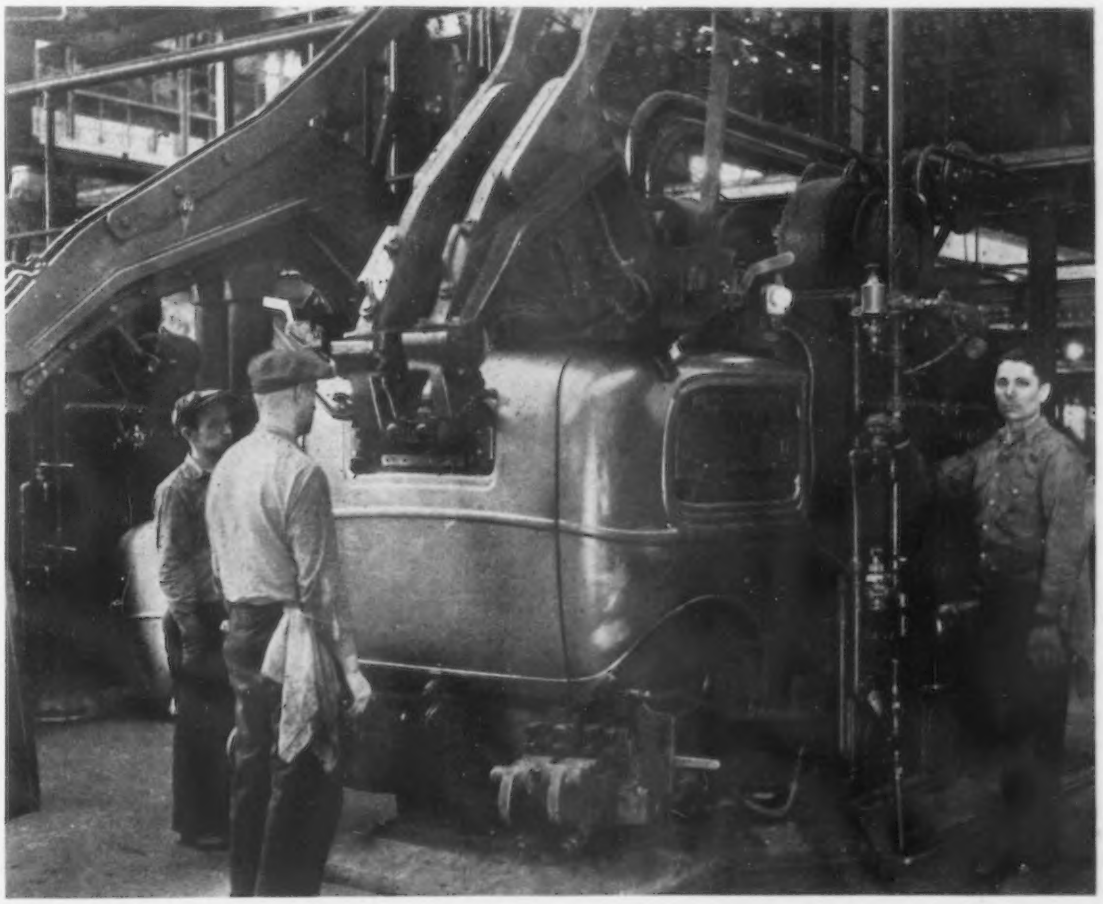
Each machine has two 250-kva. transformers taking 60-cycle alternating current supplied at 440 volts from the shop mains. The electric circuits are under the floors and the transformers are within the machine. Such an arrangement applies in general to all the welding machinery in the plant. To the transformers are attached switches arranged to provide secondary circuits of 11 to 14 volts, as each application requires. In addition compressed air from the shop's mains is used to hold the jaws against the sheets at the lines of welding.

At the moment of welding a pressure of 25 tons is applied. The sheets are of 0.038 in. gage and the total area of each weld is 1⅞ sq. in. From each edge 5/16 in. of metal is put into the welding upset. The jaws are of special hard bronze and are water cooled, water flowing through internal passages with flexible hose outside connections. The current is carried through heavy internal bronze members against which the movable jaws mentioned hold the steel panels. The rugged character of each machine is indicated by its weight, which is 22 tons.

High Speed Seam Welding

ANOTHER of the especially noteworthy welding applications is the seaming of the gasoline tank. This is made in two parts of terne sheets, as usual for gasoline containers, each flanged, and the two flanges are amalgamated by means of a resistance seam welder. This amounts to passing the flanges underneath a rotary copper disk through which current is passed at very short intervals. By making and breaking the current, spot welding is accomplished and a continuous tight weld is obtained by moving the metal under the disk so that the spots overlap.

Care must be exercised that the metal is not burned by too much current at one time or too long a contact. Mechanical breaking of the current allowed for reaching a rate of seam welding of 38 in. a minute and this appeared to be a maximum owing to the difficulty of meeting the inertia factor in speeding up the mechanical interrupter. On the basis of 5 spots to the inch (and there should probably be fully that num-



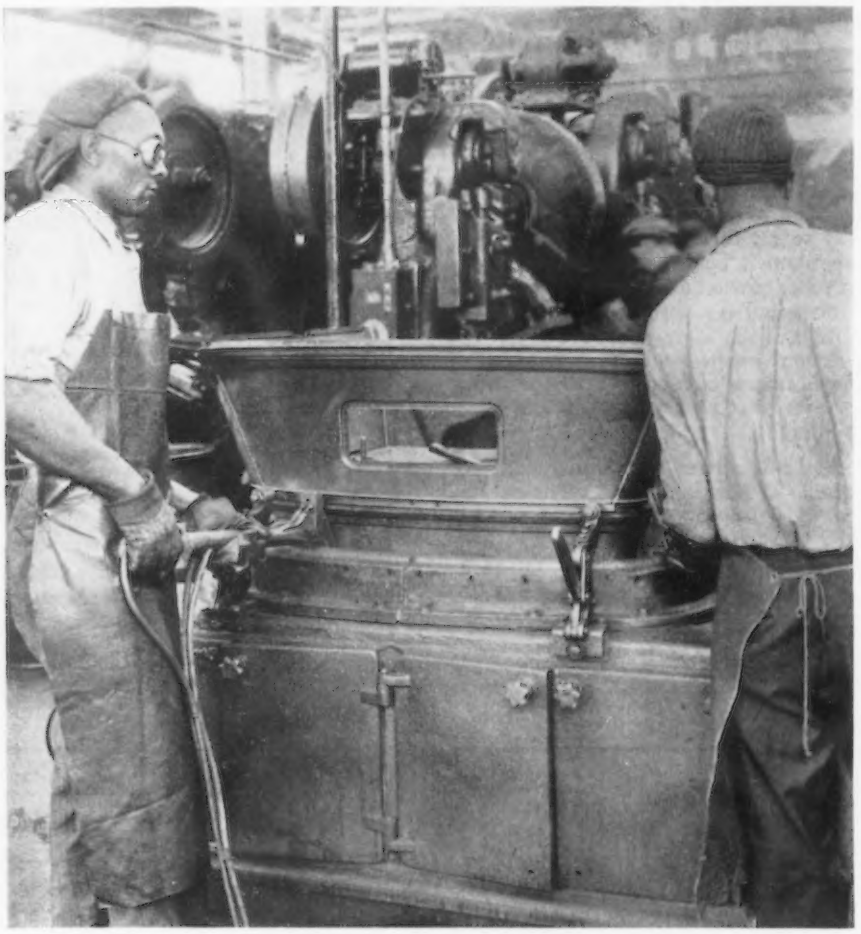
THE three panels of the car body are welded together in a cycle of operations taking less than a minute from completed weld to completed weld.

ber) a seam welding speed of 38 in. a minute would mean makes and breaks of the current at 1/3 to ¼ second intervals, itself an achievement, seeing that the interruption of the current would hardly coincide much of the time with the beginning or ending of the alternating wave.

The particular new feature in this seaming operation is the application of the thyratron tube. By its use seaming is now done at the rate of 68 in. a min. The expectation is that the seaming speed may be brought to double and perhaps more than double that when using the air break contactors, with the added advantage that the noise of the mechanical current breakers is eliminated.

An important fact of the thyratron control is that it can open and close the welding circuit at the zero point of the alternating current wave. That being the case it became immediately desirable to determine the optimum number of complete cycles that would give desirable welding results. Tests showed a good weld was produced by a welding spot which is five cycles in duration. Present practice accordingly allows the current to be on for five cycles and off for two cycles. There being 3600 cycles in a minute, there are thus practically 514 interruptions in a minute. With the material welded moving at a rate of 68 in. in a minute, there are 7.57 or nearly 8 welding spots to the inch.

One man suffices for each seaming machine and turns out 25 to 30 seamed tanks an hour. The rotary copper electrodes are driven by rotating steel disks which knurl their periphery for positive uniform traction of the seams. The electrodes are held against the material under moderate pressure and the rotating shaft has a roller bearing lubricated with graphite, which is of course a conductor of electricity. The tanks, charged with air at 10 lb. pressure, must pass a water submersion test without appearance of any air bubbles.



BAR welders put by the operator into contact with live electric conductors at the assembly rig are pushed against the work so that current passes through the far end of the bar for spot welding.

Spot Welding Appliances

SPOT welding appliances of various forms also feature the Ford manufacturing equipment. In making final assemblies of the car bodies, such as welding the bottom of the panels to the chassis and attaching the cowl section to the main part of the body, what are known as bar welders are employed. This form of welder, as the name implies, is in the form of a bar to be carried in the hand. At the hand end is a push button for throwing the switch that closes the secondary of the welding transformer.

In use, the bar, which is perhaps 24 to 30 in. long, is laid against, or put in touch with, a bare conductor so that current may flow from the conductor to the far end of the bar when its tip makes contact with the parts to be welded. Commonly a large fixture holds together the assembled parts for welding and more or less parallel with the line of welds to be made are located the heavy conductors of brass or copper.

Another spot welding appliance is given the name gun welder. It has the form of a portable compressed air or electric tool, such as might be used for light riveting. It has a throat to command a distance of 2 or 3 in. from the edge of the material welded. For convenience in handling, the gun welder is cable suspended from an overhead rail so that the operator may direct it at will without being required to support its weight. It is a flexible tool of high productivity.

Another form of spot welder has been evolved for machine operation. For example, two parts of the oil pan are joined in this manner. It was found impossible to do simultaneously in a machine the eight spot welds required in this case for the reason that the paths of current flow were not all of equal or even substantially equal resistance and multiple welding of the kind would cause burns at some spots and inadequate welds at others.

Accordingly a machine was built with eight separately actuated welding fingers, hydraulically controlled and grouped around the welding area. These are put into action successively in pairs symmetrically located. The two in operation at one moment have practically the same conditions of electric circuit and so have the next two and then the next pair and so on. More than that the welding points may be shaped as experience dictates, so that with a blunt point in one case or a relatively sharp one in another, uniform welding may be achieved. The two parts to be welded are put into the machine, the push button starts it and automatically the hydraulically manipulated fingers one after the other quickly perform their task.

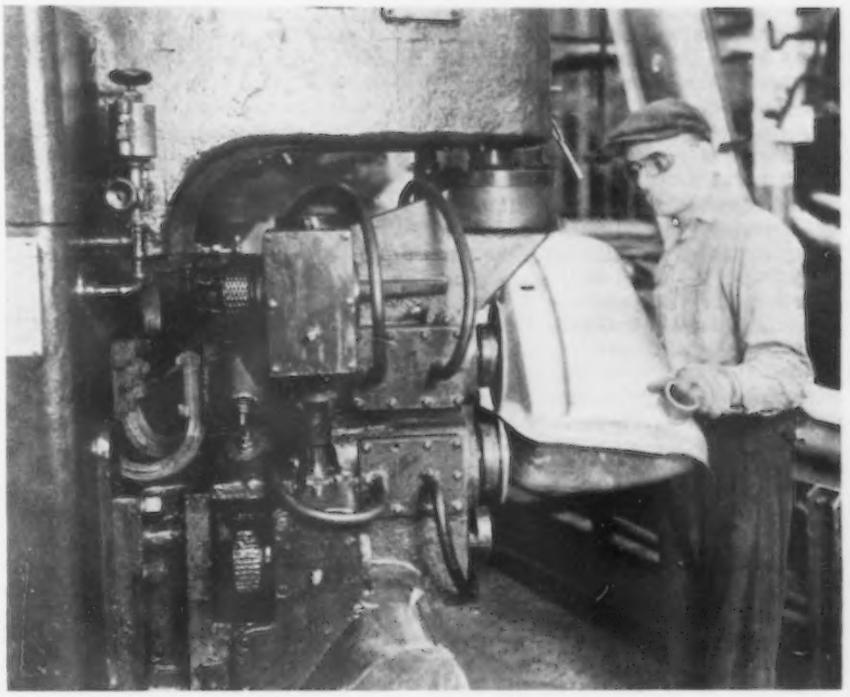
Machine Arc Welding

IN arc welding one of the notable applications is in connection with the fabrication of the rear axle housing. This, in its simplest form, is a truncated cone inclosing the axle from the differential housing to the wheel mounting. The heavy sheet of which it is made requires the closing of the longitudinal seam. The piece is placed in a machine in which the longitudinal edges are squeezed together and a welding rod is then brought into contact with the edges;

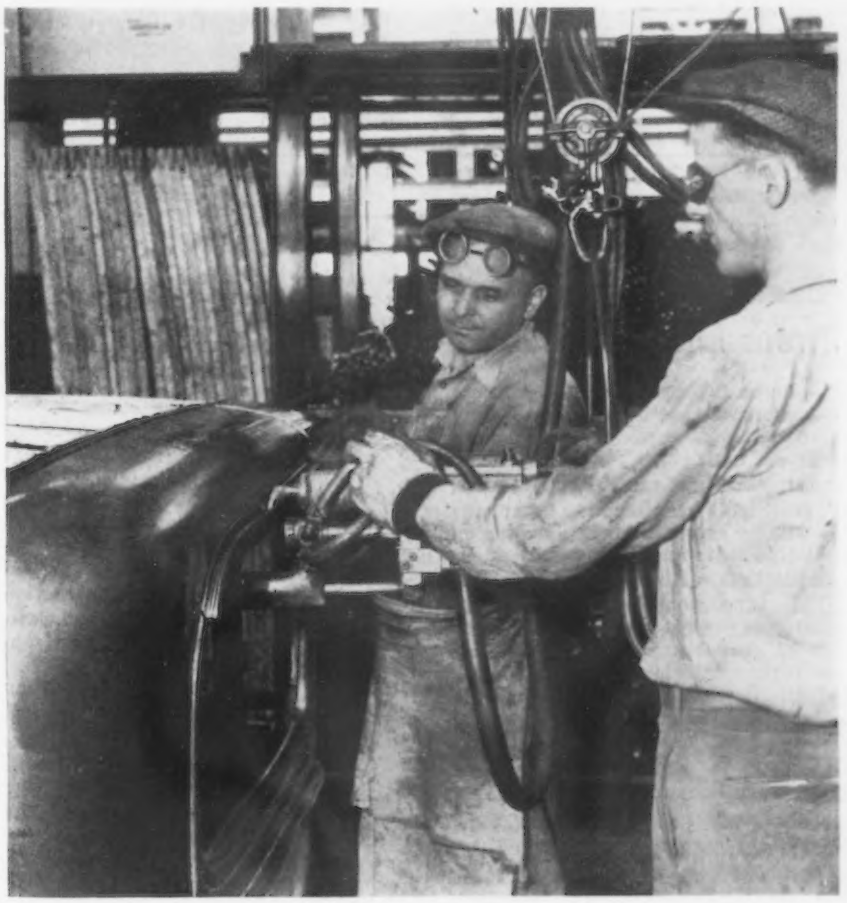
the arc is formed and the piece is moved along as the metal is brought to the molten condition, and weld metal is deposited on it.

Subsequently a forged lug for the attachment of the so-called radius rods (used for stiffening the frame of the running gear) is arc welded to the cone. This lug which fits part way around the cone toward the smaller end is first tack welded in place so that it may be finished welded in a machine. The rough housing with the temporarily fastened lug in place is mounted in a form of lathe with two welding rods on opposite sides of the lug pointing toward the junction of lug and housing. The housing is slowly revolved when the arcs get going and an indexing arrangement provides for the turning of the piece through the 60 deg. or more that the lug covers of the circumference of the housing. When the welding is complete the lathe is returned to its starting point, ready for the next piece. The axle housing also takes a bell shaped end for bolting to the differential gear housing.

In the category of flash resistance welding, the conspicuous example of which is the assembly of the back and quarter panels already described, are the assembly welding of the cowl and the wind shield frame and corner posts and also the welding of the front metal part of the car roof with that of the back. In every one of these cases special machinery has been built, representing manufacturing equipment of a character warranted only by the quantity production that will be realized from it.



FLANGES of the two parts of the gasoline tank to be connected are passed between the rotating disks for resistance seam welding at a rate of 68 in. a minute.



A GUN welder, flexibly hung for easy operation, spot welds the drip molding to the roof panel.

Various Other Welding Machines

THERE is also a considerable amount of the resistance welding of heavier sections than that covered by the butt welding of the sheet steel. Under this head comes the manufacture of the drive shaft. To opposite ends of the tubing of the shaft proper are welded the splined part for fitting into the differential and the connection for the universal coupling. Each of these welds is made in special machines of which the shop has many of the same general characteristics, differing only in minor particulars.

Each of these machines is controlled by the operator through a long lever arm. In some cases the arms are swung steadily at moderate speed until the lever reaches a marking that indicates that the current is shut off and then the operator must give a quick strong finish swing of the lever to upset the metal and complete the weld. The joints so welded include the class in which butt welds are made between circular sections, such as tubing, and a circular ended forging machined to mate with it.

In the manufacture of the mufflers, seam welding, spot welding and the flash resistance welding enter. The body of the muffler is of sheet steel. The sheet is rolled into cylindrical form with one edge lapped over the other. The lap is tack welded in a spot welder and the lap is then seam welded in a seaming machine. The cup shaped annular ring baffle inserted within the muffler cylinder is spot welded in position. Cup shaped

ends for connection with the exhaust line are flash welded in place. Each operation is performed by a different operator at a machine designed for the purpose.

An interesting application of seam welding was made in tying together the two fuel lines which run forward in the chassis from the fuel tank, one for carrying the fuel to the pump and the other for connection with the fuel gage. To tie the two copper pipes together, they are run one on top of the other between two rolls. One roll is grooved to fit one pipe and the other has a groove fitting the second pipe. In passing between the rolls the two pipes are kept together and with an interrupted current flowing through the rolls and across the two pipes, the line of contact between the pipes becomes the locus of chief resistance and a succession of spot welds results.

A case of projection welding may be noted in the mounting of instruments on the instrument board. This incidentally is of unusually rugged construction. It is carried on the dash panel by means of an extended frame. To the inner or back side of the decorative milled surface of the instrument panel are attached ears having the little stamped projections for attaching the several instruments. The projections are brought to a fusion temperature when holding the instruments against the panel openings as current is sent through the ears.

The spare tire carrier presented a difficult welding problem. The center piece is a one-piece stamping into which the studs for holding a spare tire hub are subsequently pressed. To the stamping are welded two short length tubes by means of the flash butt weld process in a special Ford designed machine. The tubes themselves are of arc welded construction, being shaped at their outer ends into a foot in each case for bolting to the car frame. The use of the machine for making this welded assembly has served to produce a construction of irregular shape that must pass the testing jig so the carrier will accurately fit its place in the finished car.

There are other unusual instances of welding which can merely be mentioned. For instance, welding enters into the manufacture of the tail lamp bracket, which has been given lines to make it an attachment of graceful outline as well as utilitarian purpose. Welding was used in making the storage battery bracket. Resistance seam welding is employed in assembling the gasoline tank for trucks. These tanks are larger than those for the passenger cars. There is a girth strip of four or five inches width, separating the top and bottom by the width of the strip and thereby securing added contents. The girth strip is in a single length and butt welded at the cross lap to make it continuous, and the top and bottom of the tank are separately seam welded to the girth strip after the manner described for the passenger car tank. In the case of both styles of tank, anti-surge baffles are spot welded to the bottom of the tank before the seaming is commenced.

Enough has been presented in the foregoing to indicate that welding in the production of the Ford motor car is truly a major manufacturing process and that it revolves largely about the development of machinery to expedite results. Conditions are anything but static. A designing force of 250 to 300 engineers and draftsmen is actively engaged in studying new ways and means, with the result that new machines and improvements to existing ones are in continuous evolution. Welding at the Ford plant is mechanized to the *n*th degree.

The Origin of the Seal of the Steel Institute

The retirement on June 7 of Theodore W. Robinson as vice-president of the Illinois Steel Co., Chicago, recalls the fact that he was the designer of the American Iron and Steel Institute seal. He presented the design at a dinner at Chicago in October, 1910, on the occasion of the first formal meeting of the institute. In an address explaining how the seal gave an allegorical representation of the principles on which the institute was founded, he said that the adoption of the motto "Right Makes Might" was largely influenced by a speech made by Judge Gary about two years previously in New York before the iron and steel manufacturers. At that time Judge Gary voiced the belief that the old principle that "Might Makes Right" was to be replaced in the world of business by the sentiment that "Right Makes Might." The theme was still further influenced by the old Biblical saying that "They shall beat their swords into plowshares and their spears into pruning hooks."

"In its details," said Mr. Robinson, "this seal shows you the sword and the spear transfused by the alchemy of wisdom into the plowshare and the pruning hook. The crucible represents the birth of steel, the steel of war and the steel of peace; but these simply surround the central motif, the spirit of cooperation symbolized by the bird of immortality, the Phoenix, rising from the ashes of discord, enmity and strife into the rays of enlightened life.

"In its finality, the seal, bound by the stury oak and wreathed with the leaves of olive, forms perhaps a fitting laurel to the strength of unity and the gospel of cooperation."

Volume Changes of Cast Irons During Casting

Changes taking place in the linear dimensions of cast iron during cooling from the freezing range to room temperature have been the subject of many investigations. Few studies, however, have been made to determine the volume changes during cooling in the liquid state and during subsequent solidification. This latter information is of fundamental importance to foundrymen in the design and production of sound castings. Its application in the determination of the size and position of gates and risers is essential for the production of castings free from shrink holes and porosity.

The Bureau of Standards, in cooperation with the American Foundrymen's Association, has studied the volume changes undergone by cast iron during casting. In Research Paper No. 440, published in the May number of the Bureau of Standards *Journal of Research*, the specific volume-temperature relationship occurring in eight types of cast irons during cooling from the liquid state to room temperature are given. The irons varied in composition from gray iron to white iron.

The coefficient of volume shrinkage in the liquid state for the irons over the range of temperature studied was 0.011 per cent per deg. C. The volume change during solidification varied from an expansion of 1.65 per cent in a gray iron to a contraction of 5.85 per cent in a low-carbon, low-silicon type of iron. The linear contraction of the sand-cast bars varied inversely with the silicon and carbon content and also with the cross-sectional area. The lowest linear shrinkage value measured was 0.67 per cent (1½ in. sq. bar) and the highest was 2.08 per cent (¾ in. sq. bar).

New York Railroad Club will have its annual outing on Wednesday, June 29, at the Westchester Country Club, Rye, N. Y.

Large Replacement Demand for Machine Tools Accumulating

Dealers Regard Outlook as Good When Business Recovery Sets In—Modernization of Equipment Necessary

UNDERLYING conditions in the machine tool industry, with emphasis on the probable scale of operations in the important industrial centers of the country, formed the principal topic for discussion at the spring meeting of the Associated Machine Tool Dealers, held at Granville, Ohio, on June 6 and 7. Leading dealers in various cities of the country were asked by William K. Stamets, Pittsburgh, president of the association, to prepare papers analyzing basic industrial conditions in their territories, with a view toward determining whether machine tools will be required in the near future in a volume comparable with that of normal years.

The survey indicated rather conclusively that manufacturers realize the absolute necessity of modernizing their plants by replacing obsolete and worn-out equipment if they are to compete effectively in future markets. It was indicated that the amount of this replaceable equipment is so large that it should keep equipment factories busy for many years to come. At the same time a majority of the dealers agreed that manufacturers are disposed to purchase new equipment in preparation for the future until their present facilities are again in operation. It was also brought out that the business of the next few years is likely to be placed strictly on a price and quality basis, and that the dealers, more than ever before, must be prepared to seek orders with a thorough knowledge and understanding of their customers' problems.

Many Replacement Possibilities

The attitude of the group was probably well brought out in the report of W. F. McCarthy, Henry Prentiss & Co., New York, covering New York State, New England and parts of Pennsylvania and New Jersey. In this section, according to Mr. McCarthy, "There are sufficient replacement possibilities to insure a satisfactory volume of business for our manufacturers when conditions return to normal, unless the American people are to be satisfied with the 'stand-still' policy which is being experienced at present. We do not believe anything like this can happen while we as a people have the ambition to progress; therefore we are encouraged to rely on such factors as have been and still are creating good prospects for future sales.

"Obsolescence, of course, plays an important part in this respect, as it is a force continuously at work—and in dull times more rapidly than when we are busy. Everyone knows that our designers have not been idle during the past three years, even though there have been but few new designs announced. This is to be expected when there are no buyers. We also know many of our customers are creating new products and improving old ones, which, if they are to be manufactured economically, will require additions to present machine tool equipment. With such facts in mind, we believe that when the turn comes, it won't take long to build up sales to at least normal volume."

Old Machines a Liability

The obsolescence factor was emphasized by J. Roy Porter, Marshall Huschart Machinery Co., Chicago. "It would appear," said Mr. Porter, "that before any new equipment is to be purchased, the old equipment will have to be running; but during the time of this depression, the industry which we represent has been remodeling its products, and new methods of manufacture with the consequent use of new tools has been given much consideration. A plant loaded with old machines will find them a liability rather than an asset." As an example, Mr. Porter mentioned a company in his territory which has taken up the manufacture of a new product and purchased new equipment for its production. It is now taking business away from a company which has sufficient capacity to furnish enough of this particular product to supply the entire country.

Mr. Porter also urged selling agents to be in closer touch with their manufacturers. "They rely upon the seller," he pointed out, "to acquaint them with any changes in the demands of the market."

No Surplus of Good Tools

A hopeful note was sounded by John Sauer, Jr., Peninsular Machinery Co., Detroit, in a comparison with the depression of 1921. "At that time," he said, "there was a vast lot of machinery on the market and many of these machines were brand new, having been built at the close of the war boom. These machines had to be absorbed when business began to come back. The same condition will not be found today because all of the surplus machinery on the market is well used. In fact, much of it is ready for the scrap heap. This alone makes the future look better than it did in 1921."

Further hope was suggested by W. J. Radcliffe, E. A. Kinsey Co., Cincinnati, in discussing the future trend of the industry. "We are now," he said, "practically in the beginning of a new era insofar as cutting tools are concerned, and it is reasonable to assume, because of the great possibilities offered by cemented-carbide tools, that many of the machines now in manufacturers' plants will have to make way for the machine of today, designed to use either high-speed tools or cemented-carbide tools to the very best advantage. Not only machines of exceptional power and rigidity will be required, but unparalleled speed ranges will be called for."

Definite preparation for future business was cited by F. W. Schiefer, of Crane, Schiefer, Owens, Inc., Syracuse, N. Y., reporting for central New York. In the past two years this company has card indexed hundreds of jobs on which a substantial saving over present methods can be shown when production requirements are increased sufficiently. When money is available, orders for new machines will be forthcoming. At present the company is keeping in close touch with all such prospects.

Scrap Dealers Protest Against Steel "Dumping"

The board of directors of the Institute of Scrap Iron and Steel, at a meeting in Cleveland, June 7, passed a resolution of protest against the dumping of foreign steel in the United States, and authorized Benjamin Schwartz, director general of the institute, to petition the Bureau of Customs, Treasury Department, and the Tariff Commission at Washington for the placing of an embargo on such importations. It was stated that the tonnage of foreign steel imported last year prevented domestic mills from buying a large tonnage of scrap which would have enabled scrap dealers to employ 25,000 additional workers.

Marking of Foreign Bars Effective July 14

WASHINGTON, June 14.—Early action is expected to be taken by the Bureau of Customs regarding further consideration it is giving to its order of April 14 requiring the marking of concrete reinforcement bars with the name of the country of origin. The bureau meanwhile extended 90 days, or until July 14, the date when the order becomes effective. Originally it required that the bars be marked beginning 60 days after the decision was made.

Mobilize Forces to Bring About a Reduction in Tax Burden

THE mobilization of forces on both a State-wide and national scale to bring about a reduction in taxation was given impetus by a conference on public expenditures, held under the auspices of the New York State Economic Council in New York, June 10. The way to reduce unemployment and want is through the revival of normal private industry, declared George W. Wickersham, chairman of the board of the council. To reach that result, he said, the burden of unnecessary taxation must be lifted and the regulatory powers of government devoted to helping and not crippling individual endeavor.

"Legislators, national and State, seem singularly blind to the fact that lavish public expenditures of the past must be stopped and the process of public economy substituted for the régime of spending, if we are to work out of the depression," Mr. Wickersham asserted.

Tax Burden Has Created an Emergency

A resolution unanimously adopted by the conference declared that the country faces a great emergency and that one of the greatest obstacles to a revival of confidence and of private economic activity is excessive public spending. Total taxes, it was stated, absorbed one-fifth of our national income in 1930 and have continued to increase since that time. The earliest possible action was urged to reduce Federal expenditures in keeping with the reduced national income; to reduce State expenditure at least to 1927 levels, a reduction of $75.000,000, or about 25 per cent below 1931; and to reduce local expenditure generally at least to 1924 levels, a reduction, roughly, of 25 per cent below 1931. Laws were condemned which artificially raise the cost of public works, both because the people are entitled to have their public improvements built at as low a cost as private enterprise and because high public construction costs discourage private construction. Communities which have asked the Government not to erect projected public buildings in their localities were applauded. While it was conceded that business has made mistakes in judgment and sometimes of integrity, private business initiative was declared the greatest hope of the people for the opportunity for employment.

The conference was not limited to the tax problem in New York State. Col. R. R. McCormick, publisher of the Chicago *Tribune*, voiced the viewpoint of Middle Western business leaders when he declared that prompt action to slash the tax burden is imperative. "Money is being spent by public bodies faster than it is being accumulated by private individuals and private business," he asserted. He condemned the new national revenue bill as inadequate and inequitable and asserted that if that law remained on our statute books our civilization would fall like that of Rome. George W. Rossetter, president of the Chicago Association of Commerce, told of the recent formation of the National Organization to Reduce Public Expenditures, with a membership representing 648 organizations throughout the country.

Veterans' Relief Expenditures Huge

Grenville Clark, of Root, Clark & Buckner, New York, recounted how the National Economy League was being organized on a nation-wide basis to combat the "legalized abuse of veterans' expenditures." Expenditures for veterans' relief, he pointed out, now total approximately one billion dollars annually. He cited statistics showing how relief for veterans, including those of the Civil and Mexican wars, had been pyramided until the expenditures now form a "fantastic burden." He explained how Congress in 1930 passed a law making allowances to World War veterans for all present disabilities, regardless of whether they had their origin in military service or not. He estimated that the Government had already spent $6,000,000,000 on World War veterans and that, if the relief system is expanded on the same scale as for other groups of veterans, it will have spent not less than $21,500,000,000 on World War veterans by 1945. The veterans' relief bill now before Congress calls for an expenditure of $928.000,000 and, if enacted, will make all thoughts of balancing the budget futile, he said.

Zinc Die Castings More Stable in Dimensions

The most important problem which confronted the zinc die casting industry a few years ago was the developing of alloys possessing stability of dimensions and properties, according to a paper, "Recent Developments in Zinc Die Castings," by W. N. Peirce, chief, metal research division, New Jersey Zinc Co., Palmerton, N. J. The paper was presented at the convention of the American Zinc Institute in St. Louis, April 18 to 22.

The leading producers of zinc have now placed on the market an adequate tonnage of metal very low in lead. As a result, zinc die castings are produced today which are so stable that they can be safely recommended for a vastly widened field of use. Gasoline meter parts, electric meter parts and other electrical and telephone equipment parts can now be die cast from zinc where the narrow dimensional tolerances previously made zinc die castings unsuitable.

Every step which has improved zinc die casting alloys in the last dozen years has depended ultimately on the exclusion of harmful impurities. Cases of contamination are becoming less and less frequent, though unfortunately they are still encountered occasionally and constitute a menace to the industry.

High tensile and impact strength, as compared with most cast metals, has always been one of the advantages of zinc die castings. The stabilization of the alloys to guarantee retention of strength has been mentioned as one of the recent important advances in the art. This has made possible die cast zinc golf club heads, typewriter frames, windshield brackets, door checks and many other parts requiring permanent impact and tensile strength, Mr. Peirce pointed out.

I.C.C. Decision Upholds Rates in West on Pipe

WASHINGTON, June 14. — Passing upon a complaint by the Missouri-Kansas Pipe Co. and others, the Interstate Commerce Commission in a decision announced recently held that rates on iron and steel pipe from a wide producing territory to points in Missouri, Kansas and Oklahoma are not unreasonable. Points of origin include Pennsylvania, Michigan, West Virginia, Ohio, Indiana, Illinois and Missouri.

Die Casting Company Formed by Allied Men

The Advance Pressure Castings, Inc., 34-48 North Fifteenth Street, Brooklyn, has been organized by men who were executives of the former Allied Die Casting Corpn. of Long Island City, N. Y. A. F. Waltz, who was president and general manager of the Allied company, heads the new organization as president, and associated with him are the following: W. Jensen, formerly chief engineer of Allied and before that chief engineer and superintendent of the Newton Die Casting Corpn., New Haven, Conn.; Alfred Rusch, formerly manager of the trimming department of Allied; R. Zaleskie, formerly manager of the casting department of Allied; F. Dertinger, formerly chief inspector of Allied, and H. Bonzak, formerly maintenance engineer of Allied. The new company will specialize in die casting production in the zinc and aluminum base alloys.

OFF THE ASSEMBLY LINE

Ford's Large Output to Be Maintained; Some Motor Plants Face Idleness

DETROIT, June 13.

WITH the year not yet half gone, the automobile industry is turning its energies toward next year's models, a number of which are expected to appear in the early fall. This is an acknowledgment that so far as present lines are concerned manufacturers outside the light car field have no hope of overcoming the present sales impasse. Auburn is the only exception, since it is relying on a drastic price cut to revive demand for its current series.

Graham-Paige can lay claim to the distinction of inaugurating the new season, as it will announce on Saturday of this week its 1933 six. In outward detail, this car is a counterpart of the Graham eight; it likewise embodies the same mechanical features in a chassis with an 118-in. wheelbase. The price has not yet been revealed, but it will be low enough to compete in the light car market, which is getting 85 to 90 per cent of today's motor car business. Incidentally, it is permissible according to the industry's custom to have a car offered at mid-year or later advertised as a following year's model.

At least several well-known automobile makers find themselves facing an unpleasant situation. Early in the year they did not dream that sales would drop away almost to nothing before summer arrived and in the first few months they produced far more cars or car parts than were needed. That is, their production quota, predicated on the year's estimated sales, was far too high, but cars were turned out for several months at the quota rate before the year's total assemblies were sharply reduced to conform to retail orders. The result is that today these companies have only a few thousand cars to make prior to starting work on new models. To be specific, one medium-price car builder set 80,000 cars as its goal for 1932, but due to the depression has had to halve this estimate.

Ford probably will continue throughout the summer its present production rate of 5000 cars a day five days a week.

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Chevrolet sold 48,000 cars at retail during May.

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Graham-Paige opens 1933 season with a new six. Auburn drastically reduces prices. Other makers hold to "watchful waiting" policy.

To meet the revised figure of 40,000 cars, it has to make only 4000 cars more and then it is through manufacturing until its 1933 line is ready. Under the circumstances it logically might be expected that this company would finish its run of cars and begin immediately on a new car with which to stimulate public interest. However, the management is convinced that it would be folly to go to the expense of making model changes just now and consequently is committed to a "watchful waiting" policy. Upon the possibility of a resumption in retail buying depends whether production will be started on 1933 models in September or later. This means that during the summer months this company's plant, like that of many others in the same predicament, will be virtually idle.

Caution Pervades Industry

The same caution is governing those who were preparing to lay siege to Mr. Ford's position with new, low-price models. Originally scheduled for July, the new Hudson-Essex car will not be shown until August or possibly September. However, steel has been ordered for the first 4000 cars. Other ventures in this field are fading farther into the background. In the quality group, one company which has been practically shut down since May 1 is likely to continue idle through the summer. It has parts made up in case orders from dealers are placed and will not assemble more cars except on specific retail orders. This is almost equivalent to making every car a custom-built job.

Auburn's price slash of $300 to $800 on its eights and twelves is not considered a forerunner of other price reductions in the industry. Flushed with its remarkable success of 1931, it went into this year with high hopes of repeating its last year's gains and accordingly built up large inventories in anticipation of business which failed to develop. The new prices on the eight, which are within a short distance of the "big three"—Ford, Chevrolet and Plymouth — already have had the desired result of arousing retail demand. At Connersville, Ind., 1400 men returned to a six-day-a-week schedule and production of the eight will be 85 cars a day by the end of this week. By July 1 it will be increased to 125 cars a day.

Production of the Ford Motor Co. is being maintained near a level of 5000 cars a day five days a week and indications are that this rate will continue through the summer months. Stocks of parts at branch assembly plants are being brought into better balance and some suppliers, especially Briggs and Murray, are reaping the benefits of generous releases. Steel orders have been smaller. The next steel buy is expected some time after June 20, when the July production program will be set up.

Chevrolet's retail sales in May were about 48,000 cars. General Motors' retail sales last month slumped considerably, standing at 63,500, compared with 81,573 in April and 122,717 in May a year ago. For the second consecutive month sales to consumers exceeded sales to dealers. The National Automobile Chamber of Commerce estimates May output for the industry at 185,970 cars.

New Magnetic Alloy Is Developed in England

A new magnetic alloy, known as "D. C. I.," is announced by Darwins, Ltd., Sheffield, England. It is a cobalt-iron alloy containing between 30 and 40 per cent of cobalt, the remainder being iron. It is characterized by extremely high flux densities at moderate magnetizing forces.

Bars magnetized to saturation are said to maintain no appreciable magnetic flux when the exciting field is removed. The alloy is intended for incorporation in magnetic circuits required to produce very high flux densities across narrow air gaps. It is claimed to be suitable for pole-pieces and apparatus for the interconversion of electrical and mechanical energy such as are used in sound recording and reproducing apparatus, particularly where excessively high magnetizing forces are not desirable.

Unfilled Orders Decline to Lowest on Record

The fourteenth consecutive decline in the unfilled tonnage of the United States Corpn. occurred in May. The drop amounted to 149,764 tons, bringing the total of unfilled orders as of May 31 down to 2,177,162 tons, the lowest on record.

Unfilled orders at the end of each month since 1929 follow:

	1932 Tons	1931 Tons	1930 Tons
January	2,648,150	4,132,351	4,468,710
February	2,545,629	3,965,194	4,479,748
March	2,472,413	3,995,330	4,571,653
April	2,326,926	3,897,729	4,354,220
May	2,177,162	3,620,452	4,059,227
June	.....	3,479,323	3,968,064
July	.....	3,407,816	4,022,059
August	.....	3,169,457	3,580,204
September	.....	3,144,833	3,424,338
October	.....	3,119,432	3,481,763
November	.....	2,933,891	3,639,636
December	.....	2,735,353	3,943,596

International Conference to Discuss Management

Presentation of more than 100 papers has been planned for the fifth International Congress for Scientific Management, which will be held at Amsterdam, Holland, July 18 to 23. Exponents of scientific management from 18 countries will exchange ideas on budgets and cost methods, the selection, training, promotion and remuneration of personnel, and production and marketing.

Organizations cooperating in the congress include the American Society of Mechanical Engineers, Taylor Society, Society of Industrial Engineers, American Management Association and National Association of Cost Accountants. I. M. C. committee of the U. S. will be officially represented by Dr. Lillian M. Gilbreth, Montclair, N. J., vice-chairman, and Wallace Clark, consulting engineer, Wallace Clark & Co., New York and Paris.

Western Pacific to Build a Branch Line

WASHINGTON, June 7.—The Western Pacific Railroad has applied for a loan of $759,000 from the Reconstruction Finance Corporation, part of which is wanted to pay for work in constructing a branch line. Other purposes are for miscellaneous capital expenditures in a program of additions and betterments under a contract with the Baldwin Locomotive Works and to pay for miscellaneous materials, etc.

Alloy Steel More Popular in Great Britain

The increasing application of alloy steels in general engineering in the United Kingdom is an indication of the desire to take advantage of the higher stresses for which these materials are useful, at the same time reducing weight. As a result of this tendency the Appleby Works of the United Steel Companies, which have heretofore manufactured only mild and medium carbon steels for boiler, ship, bridge, tank, and structural purposes, are now manufacturing nickel steel plates in all sizes from ½-in. thick upward. Nickel steel plates are now widely used for heavy vehicle chassis frames and brake drum pressed parts, as well as for structural engineering purposes and railroad work.

New Graphic Meters

A new line of recording meters has been announced by the Esterline-Angus Co., Indianapolis. It is emphasized that they represent a new design of graphic apparatus, without attempting to work over previous models. The power of the chart drives has been more than doubled, and the chart drives can be coupled to synchronize the records, even though the chart speeds are not the same. The clocks are wound from the front instead of at the side, so that instruments can be mounted closely together—two, for example, side by side on an 18-in. panel. Chart speeds of ¾ in. an hour to 3 in. a second are possible.

"Thirty-four Years of Experience in Making and Applying Timken Tapered Roller Bearings" is the title of an attractively illustrated 28-page pamphlet issued by the Timken Roller Bearing Co., Canton, Ohio. It celebrates a third of a century of engineering accomplishments "in taking friction and trouble out of one industry after another."

Trade Notes

The Linde Air Products Co., 30 East Forty-second Street, New York, has brought out two new regulators, designated as the Oxweld type R-48 oxygen regulator and the Oxweld type R-49 acetylene regulator, respectively. They were designed primarily as lighter duty regulators for use with the type W-15 welding blowpipe in the Oxweld sheet metal welding outfit. They are of stem-type and are unusually compact.

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A thermostatically controlled electric glue heater, which maintains the temperature of the glue in the glue pots within 2 deg. F. of the correct temperature is one of the new products offered by the Divine Brothers Co., Utica, N. Y. This is an addition to the line of thermostatically controlled steam and gas-fired heaters already made by this company.

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A new type of lead-coated steel drum of 10 gals. capacity, suitable for handling, shipping and storing acids, has been designed by the Gross Engineering Corpn., 3955 West 25th Street, Cleveland. Larger sizes can be supplied. The new drum conforms to the 5-A specifications of the Interstate Commerce Commission Bureau of Explosives for use with sulphuric acid of all strengths, battery acid, electrolyte acids and hydrofluoric acid, as well as for phosphorus liquid compounds, bromine and other liquids which do not attack lead.

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Standard Sand & Machine Co., Machinery Hall Building, Chicago, subsidiary of National Engineering Co., has acquired the business and patents of Carol Engineering, Inc. In addition to sand mixers and continuous roll mixers, the Standard company's products will include the Carol sand muller. S. T. Johnston has been made president of the company, and W. C. Packard has been appointed sales manager.

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Containing more than 128,000 volumes, 5000 pamphlets, 6320 maps and 3870 searches, the Engineering Societies Library, 29 West Thirty-ninth Street, New York, is believed to be the largest strictly engineering library in America. Last year it received nearly 50,000 requests to supply technical information.

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Production of galvanized pails and tubs in April totaled 126,162 doz. as against 121,322 doz., in March, according to reports received by the Bureau of the Census from 13 establishments. The output of other galvanized ware was 19,345 doz., as compared with 24,063 doz. Shipments of enameled sheet metal ware in April declined to 195,540 doz., from 276,725 doz. in March, according to reports received from 15 manufacturers.

Food for Thought—and Action

By JOHN H. VAN DEVENTER
Editor, The Iron Age

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THE metal-working industry, comprising the production of metals and their fabrication into machinery and products, constitutes our dominant industrial activity. In normal years, the payroll of this industry amounts to approximately 40 per cent of America's total payroll for all manufacturing industries.

The number of employed, or unemployed, is not a guide to the status of activity at a time like this, when, in many cases, a few hours of work per week constitute employment. The shrinkage of payrolls gives the true picture of the industry's drastic curtailment, shows what has happened to the "consuming power" of the average metal-working wage earner, of whom some 3,000,000 are normally employed.

Following are the preliminary findings of a survey made last week by THE IRON AGE to obtain and present first-hand and authoritative information regarding the present situation in our industry. These data, drawn from a wide and representative number of metal-working concerns, provide an accurate picture of payroll reduction. They show, for different classes of products, the shrinkage of current payrolls from those of the corresponding period of three years ago.

	Current Payroll in Per Cent of Corresponding Period, 1929
Industrial equipment, comprising machine tools, general production machinery, materials-handling and shop equipment	26.8
Power plant equipment	41.7
Agricultural machinery	45.0
Household equipment	42.0
Iron, steel and metal production	34.8
Castings	35.0
Forgings	23.0
Stampings	44.0
Fabricated structural materials	46.0
Nuts, bolts, rivets, screw machine products	27.0
Small tools and mechanical replaceables	41.2
Mechanical product parts	27.0
Automotive	46.5
Metal consumer products	57.8
Unclassified	36.3
Average, all groups (202 establishments)	38.2

These figures reflect wage reductions as well as the curtailment of working hours. They show that the total of wage earners' and executives' incomes, in the chief division of manufacturing industry, have been trimmed nearly 62 per cent below 1929 levels.

Contrast, if you please, what management and labor in our industry have been obliged to do and to take with the pitiful, and thus far futile, attempt of Congress to shave a few per cent from Uncle Sam's inflated payroll in relief of the stricken corporate and individual taxpayer.

The existence of these deplorably low levels of industrial activity and earning power in America's major industry is a serious threat to the continuance of social and economic order. The need is for an immediate solution of basic economic problems, divorced from political influence and consideration. We cannot afford to wait for a long drawn out Presidential campaign to settle pressing economic issues.

The present critical state of industrial wages and earnings demands the creation of a non-partisan super-board of economic strategy, a body composed of outstanding leaders in industry, business and labor who could study and report on such matters as government economy, taxation, tariffs, Russian recognition and the bonus without thought of political allegiance or campaign propaganda. Such a board would need no powers beyond the overwhelming public sentiment which would support its recommendations.

No other step could so quickly restore public confidence, or so completely divorce economics from politics during the forthcoming Presidential campaign.

And politics must be divorced from economics if we are to win our battle with this non-partisan depression. Business this year is neither Republican nor Democratic. It is too hard pressed by conditions to be interested in party labels. It is no time for a tug of war; we must all pull together.

... PERSONALS ...

ALDEN C. CUMMINS, until recently director of power distribution, has been made assistant general superintendent of Duquesne steel works of the Carnegie Steel Co., Pittsburgh, succeeding DAVIS C. BURROUGHS, who resigned on Jan. 31, 1932. Mr. Cummins is a native of Pittsburgh, and, after attending the public schools and Shadyside Academy, he was graduated from Lehigh University in 1910. In July of that year he went with the Westinghouse Electric & Mfg. Co., East Pittsburgh, where he remained until January, 1911. At that time he went with the Carnegie Steel Co. as a draftsman and successively became assistant superintendent of the electrical department, superintendent of the ferroalloy furnace and electrode factory and superintendent of the electrical department at Duquesne steel works. Later he was given control of all interworks electric transmission lines between Carnegie plants in the Monongahela Valley, with title of director of power distribution. He is a member of the Pittsburgh section executive committee of the American Institute of Electric Engineers, a former president of the Association of Iron and Steel Electrical Engineers, and a member of the Engineers Society of Western Pennsylvania, and the Electrochemical Society.

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LEW E. WALLACE has been appointed New York district sales manager of the Youngstown Sheet & Tube Co. succeeding W. B. BLOWERS, who will continue with the company as a special representative. Mr. Wallace has been with the Youngstown Sheet & Tube Co. for many years and recently as assistant manager of pipe sales.

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WILLIAM H. DONNER, former head of the Donner Steel Co., Buffalo, has established a foundation for the study of cancer with an endowment of $2,000,000.

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A. W. ROBERTSON, chairman of the board of the Westinghouse Electric & Mfg. Co., East Pittsburgh, has been elected chairman of the board of trustees of Allegheny College, Meadville, Pa. Allegheny also conferred the degree of LL.D. upon Mr. Robertson at its commencement exercises last week.

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J. R. COMSTOCK, blast furnace engineer and metallurgical specialist, and F. E. CLARK, open-hearth engineer, sailed May 28 to join the Freyn Engineering Co. organization which is furnishing consultation services to the Soviet iron and steel industry. The contract covering the furnishing of these services has recently been renewed and as a result W. S. ORR, rolling mill engineer; N. H. LAGERSTROM, tube mill specialist, and L. D. ANDERSON, mining engineer and sintering plant specialist, who had been in Russia for one or two years, returned there on June 15. B. L. JONES, roll designer, and S. B. HAARBYE, sheet, strip and plate mill engineer, will sail June 27, to become new members in the Freyn organization at Leningrad. L. E. L. THOMAS and GORDON FOX, who have been directing activities of the Leningrad group for the past few years, will continue their stay in Leningrad. Several other engineers will join the group later.

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W. W. MACMILLEN, purchasing agent, National Malleable & Steel Castings Co., Cleveland, was the recipient of the annual award of the Institute of Scrap Iron and Steel, the presentation having been made at the banquet of the National Association of Purchasing Agents in Detroit on June 6. Mr. MacMillen was selected "as the individual who made the outstanding contribution to the progress and welfare of the scrap industry during 1931." The award was made by BENJAMIN SCHWARTZ, director general of the scrap organization, who stated that it was given as a tribute to the purchasing agents for their cooperation in helping the scrap institute establish a program of improved standards of merchandising in the industry.

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WALTER A. BLACK, formerly chief engineer of the Indianapolis works of Fairbanks, Morse & Co., has been appointed by the Allen-Bradley Co., district manager of its office at 942 Prospect Avenue, Cleveland. JOHN B. VOGEL has been placed in charge of the company's district office at 41 Grandville Avenue, S. W., Grand Rapids, Mich.

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J. C. HAYES, JR., and VINCENT W. KING sailed June 15 to join the Kuznetsk organization of Freyn Engineering Co. in Siberia, where a complete steel works is being built by the Freyn company. Mr. Hayes is returning there from a vacation after having spent nine months at the Kuznetsk works, during which time the initial blast furnace was blown in.

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D. S. HARDER has been appointed works manager of the Budd Mfg. Co., in charge of production at the plants in Philadelphia and Detroit, with headquarters in Philadelphia. Mr. Harder was formerly works manager of the Detroit plant. LEROY A. COLEMAN is production supervisor of the Detroit plant.

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WILLIAM E. ODOM, for the past eight years director of industrial relations of the National Metal Trades Association, has resigned that post to become vice-president and a member of the editorial staff of *Industrial Relations*.

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MYRON C. TAYLOR, chairman of the United States Steel Corpn., returned last week from a brief visit to Paris and London.

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H. M. DAVISON, who has been excavator sales manager of the Harnischfeger Sales Corpn., Milwaukee, has resigned. He is now in the East completing plans for a new organization.

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H. V. SCHIEFER, heretofore of the R. H. Beaumont Co., has become identified with C. O. Bartlett & Snow Co., Cleveland, in connection with the sale

A. C. CUMMINS

L. E. WALLACE

WILLIAM H. DONNER

of fuel and ash handling equipment and bulk material handling systems.

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H. H. McFARLANE, secretary of Pierson Son, Inc., has been appointed district sales agent for the Janson Steel & Iron Co., Columbia, Pa., with headquarters at 11 Park Place, New York.

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FRANCIS O. WYSE, advertising manager, Bucyrus-Erie Co., South Milwaukee, Wis., has been reelected president Milwaukee chapter, National Association of Industrial Advertisers.

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WALTER G. PATTON has been appointed traffic manager of St. Joseph Lead Co. with offices at 250 Park Avenue, New York, and Bonne Terre, Mo., to succeed the late Felix J. Thomure.

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WILLIAM JAMES FIRTH, well-known British tin plate manufacturer and industrialist and chairman of Richard Thomas & Co., has been created a knight.

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W. E. SIMONS, manager Ford Motor Co., Fargo, N. D., has been transferred to Milwaukee to succeed L. T. HENDERSON, who has resigned as branch manager. Mr. Simons has been associated with the Ford organization for 17 years, having started in the service department of the branch at Scranton, Pa., and having become assistant manager. He served six years as assistant manager of Cleveland branch before he was placed in charge of Fargo plant in 1928.

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A. CLARK MOORE has been elected president of the Chicago Railway Equipment Co., succeeding E. B. Leigh, whose death was reported in THE IRON AGE of May 26. Mr. Moore has been with the company since 1921 as a vice-president and for the past year has been executive vice-president.

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H. T. GILBERT has resigned as sales manager of the Midland Steel Products Co., Cleveland. Before taking charge of that company's sales he was for a time its general manager. Previously Mr. Gilbert was associated with the Republic Steel Corpn. as vice-president in charge of sales and later as assistant to the president.

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J. E. HARLOW has been appointed Cincinnati district representative, with office at 7 East Sixth Street, for the Magnetic Mfg. Co., Milwaukee, Wis.

OBITUARY

A. L. CROMLISH, general superintendent of Duquesne works, Carnegie Steel Co., Pittsburgh, died suddenly at his home in South Duquesne, Pa., on June 9. He had been with the Carnegie company for more than 30 years, having gone with that organization from the Shenango Valley Steel Co., New Castle, Pa., in 1899. Mr. Cromlish was born at Wilkinsburg, Pa., in 1876, and attended East Liberty Academy, and the Pennsylvania State College, of which he later served as a trustee. His first work was with the Pittsburgh & Western and the Bessemer & Lake Erie railroads during vacations in 1895 and 1896 and in 1897 he went with the Shenango Valley Steel Co., as chief chemist. Two years later he went with Carnegie Steel Co. as chief chemist of Niles Furnace and New Castle works. In 1904 he was made assistant general superintendent of blast furnaces at Farrell, Pa., and also of Donora, Neville and Edith furnaces. In 1920 he was made general superintendent at Farrell works, and on May 15, 1931, he went to Duquesne works in a similar capacity. He was a member of the American Iron and Steel Institute.

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JAMES R. MORASH, president and general manager, General Refrigeration Co., Beloit, Wis., manufacturer of refrigerator car equipment, ice machinery, etc., died suddenly June 9, aged 52 years. He was associated with the General Electric Co. at Lynn, Mass., and Chicago, for 27 years, and became head of the Beloit

A. L. CROMLISH

industry when the Lipman Refrigeration Co. was reorganized as the General company in 1923.

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H. L. McCLAREN, who was president of the former Mitchell Motor Car Co., Racine, Wis., from 1913 to 1919, died at his home in Sea Isle, N. J., on June 6, aged 55 years.

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FREDERICK MORGAN STEELE, Chicago, formerly head of the American Bridge Works, now the American plant of the American Bridge Co., died June 7, aged 81 years. Born in Albany, N. Y., Mr. Steele went to Chicago in 1879. He was honorary deputy governor of the Mayflower society and a member of the Sons of the American Revolution.

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JOSEPH C. BOLTER, for more than 50 years associated with A. Bolter's Sons Structural Steel Co., Chicago, died after a long illness on June 5. He was a native Chicagoan, and for many years had been very active in many civic enterprises.

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DONALD M. EDDY, vice-president of the Hanna Furnace Corpn., subsidiary of the National Steel Corpn., died June 10 of a fractured skull, as the result of a fall. He was born in Bay City, Mich., 42 years ago. After his graduation from Yale University, he became associated with the Hydraulic Pressed Steel Corpn., Cleveland, where he rose to the sales managership. He resigned from that position about 1918 to join M. A. Hanna & Co., of which he became director of purchases in Cleveland. Later he was made district sales manager at Buffalo for the Hanna Furnace Corpn. Mr. Eddy was elected a year ago to the post he held at the time of his death. At that time he was also made vice-president of the Donner-Hanna Coke Corpn. He was considered one of the most promising of the younger executives of the company, and took an active interest in community affars.

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AUGUSTUS D. LEDOUX, president of the Pyrites Co., Ltd., an American subsidiary of the Rio Tinto Co., Ltd., died on June 5 in New York. Mr. Ledoux graduated from the Columbia School of Mines in 1881. In the World War he was chairman of the pyrites committee of the Council of National Defense and in 1918 was chairman of the sulphur materials committee of the War Industries Board. He was a member of the American Iron and Steel Institute, the Society of Chemical Industry and the American Foundrymen's Association.

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ROBERT D. MAHAFFEY, for the past 30 years vice-president and treasurer of the American Well Works, Aurora, Ill., pump maker, died after a long illness on June 3, aged 65 years.

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WILLIAM M. SCUDDER, president of the E. E. Souther Iron Co., St. Louis, with which he began his service as an office boy 50 years ago, died of heart disease there on June 2. He was born in Cincinnati 73 years ago.

• • EDITORIAL

Governmental Economy Is Imperative

A CONFERENCE on public expenditures held in New York last week under the auspices of the New York State Economic Council focused attention on the tax burden as a major obstacle to business recovery. Instead of shrinking in keeping with the decline in business and in profits, taxes have increased both absolutely and relatively. In other words, they have not only risen in number of dollars, but the dollars themselves have increased in size. Total taxes, it was pointed out in the conference, absorbed one-fifth of the national income in 1930 and have increased greatly since then.

This huge tax burden constitutes one of the greatest impediments to a revival of business activity. In fact, it threatens to further dry up sources of revenue and to make the yield from the new federal tax bill far less than has been estimated. Income taxes represent the most important means of raising revenue, but they are the least dependable. In the current fiscal year income taxes are expected to yield a total of about $1,076,000,000, but this sum is less than half the amount received from the same source in 1929 and a continuation of the depression could easily reduce it still further, regardless of the tax rates imposed. In other words, private industry must have earnings before there can be any certainty about tax collections. Obviously there can be no earnings if the tax burden is excessive.

The only logical way out of the dilemma is to reduce public expenditures, but, as George W. Wickersham, chairman of the Economic Council pointed out, legislators still seem blind to the fact that lavish public spending must be stopped. It is regrettable, but nevertheless true, that unless private enterprise is permitted to flourish public revenues must decline. Money cannot continue to be spent by public bodies faster than it is being accumulated by private business. Governmental costs must be cut. Maudlin sentiment must be replaced by realism.

The bonus must be killed, not because unemployed veterans are not in need of aid, but because huge payments to them at this time would indefinitely postpone the time when industry could again re-employ them. Veterans' relief expenditures must be brought within reason. Our generosity to those who served in the World War has gone far beyond that of any other nation. There is no valid reason why veterans should get relief for disabilities incurred since the war and yet the National Economy League, an association consisting mainly of ex-soldiers, estimates that payments for such physical impairments total $450,000,000 annually. Finally, all administrative costs of Government must be gone over with a fine-tooth comb and all unnecessary expenditures eliminated. Drastic economy is not pleasant, but it is necessary. A crippled and prostrate industrial system cannot be expected to rise and move ahead unless its heavy burden is lightened.

Congress About to Adjourn; Business Breathes Relief

CONGRESS has blundered through a revenue bill.

It is winding up on a poor job of economy.

And it is about to adjourn.

Hence a refreshing sigh of relief from business.

The revenue bill is a hodge-podge, an obnoxious legislative mélange. It is loaded with high assessments on many incomes that are purely mythical. Utterly unfair and discriminatory taxes born of political thinking instead of statesmanship are carried in the measure. The automotive and related industries—lubricating, gasoline, and rubber have been rooked to the tune of some $275,000,000 or almost 25 per cent of the total estimated returns of $1,118,500,000 which the bill is supposed to but will not raise.

There will be some reduction of government expenditures, the savings being estimated at $350,000,000. This sum with the estimated revenue is designed to balance the budget. Even though it is not seriously believed in informed quarters that the Treasury estimates from the bill will be realized, the knowledge that the budget will be almost balanced will be wholesome in its effect on business. It may well be expected that the bill will fall greatly below affected expectations of government authorities. Even so, it will force realization of the fact that a general manufacturers' sales tax is a necessity soon, perhaps at the next session, and thus do away with discriminatory taxes which are injurious to business.

Congress probably could not resist political horseplay with conventions so near at hand. Nevertheless it has been an extremely expensive and disturbing influence. Yet if the people, including business, who really are responsible for Congress, have learned the necessity of showing more interest in government, much will eventually be gained from the experience.

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Ford Has Faith in the Machine

DURING a period of fear, hesitancy and confused thought, with many people ready to damn the machine age for the country's present economic plight, Mr. Henry Ford, foremost advocate of mass production, has not lost faith in machinery and what it can do to prove a blessing to mankind.

Speaking to the world last week through a series of paid advertisements "as a contribution to public welfare," Mr. Ford remarked, "I do not look for less but more use of machinery. If the world is to have even a minimum supply of goods, it must utilize the machine. The people will never willingly forego the help which the machine gives them in their work.

"Besides, machinery makes more jobs. It enables everyone to enjoy inexpensively the comforts and con-

COMMENT • •

veniences of modern living conditions. As for over-production, we have never yet had a sufficient production of all the things which the family needs. It would be splendid if the world should seriously attempt to over-produce everything that everybody needs. We should then discover that our present machine facilities could not even catch up with the need. Give the world a money system that makes it easier for goods to flow from man to man, and all the factories on earth could not begin to supply a tenth of the demand."

At a time when dark pessimism reigns almost unchallenged in industry, when the light of long-range prospects is obscured by the clouds hovering over the immediate future, Mr. Ford gives us fresh courage and a new point of view when he says:

"Are we to declare that 1932 is the date at which development must cease and the world be stabilized just as it is? It cannot be done. Life would burst any barrier we might raise against its ongoing. . . Our times are primitive. True progress is yet to come. The industrial age has scarcely dawned as yet. . . . We are pioneers and pioneering has its hardships. This generation is composed of economic pilgrims, passing out of less desirable conditions into what we hope shall be more desirable ones. That is the meaning of these times. We are not going back, and false prosperity is not soon coming back. It would be well to interpret present conditions in this light and help each other in the good old pioneer way, as we pass through them.

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Commencement Counsel

TO university graduates of 1932 much that appears in current print makes their going out into "the world" a veritable cold plunge. With this in mind Owen D. Young, certainly speaking as a practical man, said with emphasis in his address at Notre Dame: "Do not permit yourselves to be embittered by our disappointments. Do not permit your confidence to be impaired by our suspicions. We are paying the penalty of our own mistakes. . . . If you can survive the initial shock you will have before you the most favoring circumstances for service presented to young men at any time."

This commencement season has borne in heavily upon those in charge of our colleges the unanswered call for leaders in a time full of grave problems. No other such season has made it so plain that the purpose of higher education should be to teach young men to think and to think straight; to give them the ability to do, in any situation, what the circumstances require.

In his last baccalaureate at Yale, Arthur T. Hadley (out of his thinking as an economist, shall we say?) gave this estimate of the highest values in life, that might well have been written with the trying days of 1932 definitely in mind: "So to live and so to think that those about us will have more courage and self-sacrifice and larger and truer vision of what is required of man—these things are more important than all the scientific principles we can discover or all the material results we can achieve."

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Special Prices to Help Steel Exports

NOW that the British Government has started out to give domestic industries a tariff that will diminish imports and increase employment at home, iron and steel manufacturers over there are asked to set their house in order so as to make the most of their new opportunity. British concerns which have imported cheap Continental steel and in turn worked up such steel for the export trade are naturally solicitous about the effect the new arrangement will have on their trade. They want the committee that has in charge the reorganization of the British iron and steel industry to see to it that prices of semi-finished steel are not advanced, behind the 33 1/3 per cent recently added to British iron and steel tariff schedule, in a way that will prevent British exporters from competing in foreign markets.

It would be no surprise if British exporters of certain products—sheets and tin plate, for example—who buy sheet bars and black plate in the market, should ask the large steel companies to charge a lower price on steel entering into export products than would be asked, under the new protection régime, for steel going into consumption at home.

The late John W. Gates once raised a similar issue when he urged the producers of Lake Superior iron ore and of Connellsville and West Virginia coke to give the Illinois Steel Co. special prices on a certain tonnage of these raw materials, so that semi-finished steel might be exported from the Chicago district to Great Britain. For several reasons those concessions were not granted.

However, a few years later the tin plate workers in the Amalgamated Association did grant a rebate from scale wages on tin plate exported by a few Pittsburgh district mills. Not much came of this arrangement, though eventually American mills which were free from union limitation of output acquired a very creditable standing in the tin plate export trade.

It remains to be seen what measures Continental mills will take to compensate themselves for the British trade in semi-finished steel which the new tariff will cost them. They might turn to the export markets with which their late customers in Great Britain have long done business. Also, if the British steel companies give their sheet mill and other domestic rolling mill customers preferential prices to facilitate exports, the dumping issue might be raised in steel-making countries to which such exports go. It would appear, therefore, that after its long years of memorable achievement under free trade auspices, the British steel industry will encounter difficulties neither few nor small, in trying to adjust itself to a régime of highly protective duties.

Purchasing Agents Consider Economic Planning and Trust Law Changes

ECONOMIC planning, self-regulation by industry and the advisability of modification of anti-trust laws were subjects which loomed large on the program of the seventeenth annual convention of the National Association of Purchasing Agents at the Book-Cadillac Hotel, Detroit, on June 6, 7, 8 and 9. An "Inform-a-show" was held in connection with the meeting, the Youngstown Sheet & Tube Co. being awarded the prize for the most attractive exhibit. Aside from the general convention sessions, the usual group meetings occurred, including a joint session of iron, steel and coal members and another of mining, smelting and refining interests.

In an address on the implication of economic planning, Wallace B. Donham, dean of the Harvard University Graduate School of Business Administration, advocated the establishment of a group of men in this country, closely related to government and to business but with no authority, who should spend their time figuring out mechanisms of adjustment which will keep the swings of business activity "short of catastrophic unemployment, short of collapse of commodity prices." If such an organization had been in existence, it might have suggested in 1924 to 1928 that "in a period of prosperity like that, when curbs were needed, we should continue to tax higher to the end that in a swing like this we might be able to get along with a reduction in taxes."

Dean Donham declared that "the happenings of the last 18 months were wholly unnecessary if we had had an adequate method of national planning." If some means is not found soon to put men to work, the country faces a dole "which all the experience of this country indicates would in the long run destroy this democracy and make it a government of organized minorities living at the expense of the rest." The farm situation, said Dean Donham, could have been cured before now if American business men had been willing to face the situation and bring business intelligence into the solution of the problem, "using the same motives that have rightly led the manufacturers of this country to be protectionists."

The Pros and Cons of Industrial Stabilization

The great task before American industry is the further spread of the concept of scientific management and its application to individual business units, concluded Prof. Edwin Clyde Robbins of the Harvard Graduate School of Business Administration, in a paper evaluating economic planning. He discussed the advantages and disadvantages of attempted stabilization of industry by the Government. He emphasized that "when Government planning and regulatory boards or self-appointed trade association committees seek to control industries by setting prices below which articles may not be sold, by regulating the volume of production, by prorating business to individual companies on either a volume or territorial basis and by deciding what normal returns are in given industries, the limits of sound business practice have been definitely violated."

The country soon must choose between unregulated competition, destructive in the end to all interests, and a regulated competition which will prevent excessive prices, said Charles F. Abbott, executive director of the American Institute of Steel Construction, Inc., New York, in an address on "Self-Regulation by Industry." Self-help, self-government and self-regulation are what industry needs. It should take the initiative in removing cut-throat competition, uneconomic overproduction and unethical practices; this could be accomplished through honest cooperation among all members of an industry. If business does not do this voluntarily, governmental control with its disagreeable features can be expected. The business executive of the future, asserted Mr. Abbott, will understand production, finance and selling, but will not be a specialist in any of these.

Pointing out the benefits to be derived from economic planning, Donald G. Clark, purchasing agent, Brown & Sharpe Mfg. Co., Providence, R. I., in a paper dealing with "Purchasing Problems as Affected by Economic Planning," said that it can be brought nearer by its application "right now to our own jobs." He declared that the adoption of economic planning will simplify the purchasing job, but increase purchasing responsibilities, thus giving clear recognition to the purchasing department's importance.

Stabilization and the Anti-Trust Laws

Stabilization of commodity prices at levels which yield a fair margin of profit is an essential first step to the restoration of prosperity, and the anti-trust laws, to the extent that they militate against such stabilization, should be modified or suspended, with proper precautions against the gouging of the public, said Abram F. Myers, Washington. However, the underlying policy of the Sherman law must be given thoroughgoing reconsideration before the problem presented by the anti-trust laws can be satisfactorily settled.

Henry Ward Beer, New York, said that present anti-trust laws are workable and protective to every little and big business, but are lame as now administered. F. M. Zeder, vice-president in charge of engineering, Chrysler Corpn., Detroit, discussed the "Relation of Research to Planning." A report approving with certain revisions the American Foundrymen's Association's recommendations for buyers of castings was submitted at the iron and steel committee session.

William T. Roach, purchasing agent, Eastman Kodak Co., Rochester, N. Y., was elected president of the association. The Chevrolet Motor Co. received the annual award of a cup for the most informative exhibit at the "Inform-a-show."

British Iron and Steel Output Lower in May

LONDON, ENGLAND, June 13 (*By Cable*).—Production of pig iron and steel ingots in the United Kingdom again declined in May. The pig iron total was 315,300 tons, against 316,900 tons in April, while steel ingot output was 416,900 tons, against 433,300 tons in April. Monthly totals for all of 1931 and the five months of this year follow:

1931	Pig Iron	Steel Ingots
Jan.	337,200	402,200
Feb.	318,200	486,400
March	357,100	500,100
April	323,200	397,400
May	346,500	435,100
June	323,800	428,900
July	317,000	428,700
Aug.	275,700	375,300
Sept.	248,200	400,500
Oct.	284,200	457,400
Nov.	296,400	459,200
Dec.	330,600	422,400
	3,758,100	5,193,600
1932		
Jan.	332,400	429,700
Feb.	318,100	480,600
March	335,600	462,800
April	316,900	433,300
May	315,300	416,900

Imports of Swedish Steels

Colin G. Hoyland, president, Swedish Steel Mills, A. A., Inc., writing THE IRON AGE on behalf of the Swedish steel industry, takes issue with a statement by Thomas J. Doherty quoted in our issue of May 19 to the effect that imports of flat wire and strip steel from Sweden in December, 1931, showed an increase of 264.5 per cent over those of the same month of 1930. Total imports of those products from Sweden were 65 tons in December, 1930, and 56 tons in December, 1931, he states. He also asserts that imports of flat wire and steel strip have declined rather than gained since the Swedish kronor left the gold standard. Swedish importers, he declares, have made no attempt to take advantage of the depreciated kronor to increase their business through a reduction in selling prices.

Steel Production at New Low Point; Uncertainties Obscure Outlook

Ingot Output Not Above 18 Per Cent—Some Companies at About 15 Per Cent—Automobile Schedules Tapering Off

THE steel industry has again curtailed production, being unable to maintain even its recent low operating rates in the face of financial and political uncertainties that are throttling virtually every activity upon which the steel mills depend for business. Ingot output this week is not above 18 per cent, the daily average having fallen fully 4000 tons below that of May.

Only in the Youngstown district has there been any improvement, and that has been slight. There have been losses in production at Chicago, Cleveland, Wheeling, Detroit and in eastern Pennsylvania. Detroit capacity, which, with the support of automobile orders, has been engaged at 81 per cent of ingot capacity, is now at 75 per cent. The Pittsburgh district is barely holding at 15 per cent. A few of the larger steel companies are producing steel at not much, if any, above 15 per cent.

Current output of open-hearth and Bessemer ingots probably is not above 38,000 tons a day, against 42,593 tons a day in May, as reported by the American Iron and Steel Institute. Even in July, 1921, the poorest month of that depression period, steel ingot output did not fall below 20 per cent of the then existing capacity. The daily output in that month was 36,713 tons, while in such previous low-production periods as January, 1908, and January, 1904, the daily output figures were 34,617 and 29,186 tons respectively.

THE immediate outlook in steel is obscure. While it is generally believed that present output is very much below the wear and tear needs of the country, indicating that such low production cannot continue for very much longer, there is recognition in the trade of the depressing effect of delay in settling important legislation now before Congress. Final disposition of these matters and the adjournment of that body seem to be necessary to the restoration of confidence that must precede business recovery. Seasonal factors, which usually bring about a reduction in steel business at this time of year, are considered to be of secondary importance in the present industrial curtailment and probably would not be a bar to an expansion in July or August if underlying conditions took a decided turn for the better.

The automobile industry, upon which considerable hopes were placed until recently, has not, with the exception of the Ford Motor Co., been able to realize even its own moderate expectations, and curtailment of schedules is in evidence. The Ford company probably will continue its output of 5000 cars a day five days a week through the summer months, but some other automobile companies, particularly in the high-price and medium-price groups, face virtual idleness in July and August. Restricted production quotas of some companies, inaugurated at the beginning of the year, have been in excess of sales, and they will make only a few thousand cars each before starting on early editions of 1933 models. Caution is governing those companies which were preparing to enter the low-price field against Ford, Chevrolet and Plymouth. A steel purchase by Ford is expected within the next week, but requirements of other automobile makers are smaller.

Building construction is still too largely of a public character to be healthy, yet the prospects for improvement in this branch of steel consumption are largely dependent on projects that may be authorized in Congressional relief legislation. Lettings of structural steel the past week were 17,300 tons, compared with 43,200 tons in the previous week, and 16,500 tons in new work was added to the pending list.

Railroads are placing a few small tonnages of structural steel for bridges, but generally their purchases of all products are severely restricted. Requisitions are piling up in railroad purchasing departments, but only the most necessary orders are released. Except for a possible purchase by the Northern Pacific, there is no interest in rails, and the Chicago rail mills, which have been operating at a low rate for some time, may complete their orders and shut down by the end of June.

THE new schedule on hot-rolled strip, by which a single base price $1 a ton above the recent minimum will replace two bases, is being put into effect by all makers, but otherwise current prices on all products will be continued into the third quarter. Some contract coverage on sheets and other products at prices below those now prevailing will expire June 30; hence a good many consumers will actually pay more for steel in the third quarter than they have paid this quarter. Some acceleration of specifications is expected to result at the end of this month. It now seems doubtful whether the $2 a ton advance announced on semi-finished steel for the third quarter will go into effect.

Scrap markets are demoralized as a result of the continued curtailment of steel production, and further price declines have occurred. THE IRON AGE composite price for heavy melting steel has reached another new all-time low at $7 a gross ton. The pig iron composite remains at $14.01 a gross ton and that for finished steel is unchanged at 2.087c. a lb.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	June 14, 1932	June 7, 1932	May 17, 1932	June 16, 1931
Per Gross Ton:				
No. 2 fdy., Philadelphia	$14.84	$14.84	$14.84	$17.26
No. 2, Valley furnace	14.50	14.50	14.50	17.00
No. 2 Southern, Cin'ti	13.82	13.82	13.82	14.69
No. 2, Birmingham	11.00	11.00	11.00	12.00
No. 2 foundry, Chicago*	16.00	16.00	16.00	17.50
Basic, del'd eastern Pa.	16.00	16.00	16.00	17.00
Basic, Valley furnace	14.00	14.00	14.00	15.50
Valley Bessemer, del'd P'gh	16.89	16.89	16.89	18.76
Malleable, Chicago*	16.00	16.00	16.00	17.50
Malleable, Valley	15.00	15.00	15.00	17.00
L. S. charcoal, Chicago	23.17	23.17	23.17	25.04
Ferromanganese, seab'd carlots	68.00	68.00	75.00	85.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	32.00	32.00	34.00	34.00
Rerolling billets, Pittsburgh	27.00	27.00	27.00	29.00
Sheet bars, Pittsburgh	26.00	26.00	26.00	29.00
Slabs, Pittsburgh	27.00	27.00	27.00	29.00
Forging billets, Pittsburgh	33.00	33.00	33.00	35.00
Wire rods, Pittsburgh	37.00	37.00	37.00	35.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.60	1.60	1.60	1.65

Finished Steel

	Cents	Cents	Cents	Cents
Per Lb. to Large Buyers:				
Bars, Pittsburgh	1.60	1.60	1.60	1.65
Bars, Chicago	1.70	1.70	1.70	1.70
Bars, Cleveland	1.65	1.65	1.65	1.65
Bars, New York	1.95	1.95	1.95	1.98
Tank plates, Pittsburgh	1.60	1.60	1.60	1.65
Tank plates, Chicago	1.70	1.70	1.70	1.70
Tank plates, New York	1.898	1.898	1.898	1.93
Structural shapes, Pittsburgh	1.60	1.60	1.60	1.65
Structural shapes, Chicago	1.70	1.70	1.70	1.70
Structural shapes, New York	1.86775	1.86775	1.86775	1.90½
Cold-finished bars, Pittsburgh	1.70	1.70	1.70	2.10
Hot-rolled strips, Pittsburgh	1.40	1.40	1.40	1.55
Cold-rolled strips, Pittsburgh	2.00	2.00	2.00	2.15

Finished Steel

	June 14, 1932	June 7, 1932	May 17, 1932	June 16, 1931
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Hot-rolled annealed sheets No. 24, Pittsburgh	2.20	2.20	2.20	2.15
Hot-rolled annealed sheets No. 24, Chicago dist. mill	2.30	2.30	2.30	2.35
Sheets, galv., No. 24, P'gh	2.85	2.85	2.85	2.75
Sheets, galv., No. 24, Chicago dist. mill	2.95	2.95	2.95	2.85
Hot-rolled sheets, No. 10, P'gh	1.55	1.55	1.55	1.70
Hot-rolled sheets No. 10, Chicago dist. mill	1.65	1.65	1.65	1.80
Wire nails, Pittsburgh	1.95	1.95	1.95	1.80
Wire nails, Chicago dist. mill	2.00	2.00	2.00	1.85
Plain wire, Pittsburgh	2.20	2.20	2.20	2.20
Plain wire, Chicago dist. mill	2.25	2.25	2.25	2.25
Barbed wire, galv., P'gh	2.60	2.60	2.60	2.55
Barbed wire, galv., Chicago dist. mill	2.65	2.65	2.65	2.60
Tin plate, 100 lb. box, P'gh	$4.75	$4.75	$4.75	$5.00

Old Material

Per Gross Ton:				
Heavy melting steel, P'gh	$9.00	$9.00	$9.50	$10.25
Heavy melting steel, Phila.	6.25	6.25	6.50	9.50
Heavy melting steel, Ch'go	*5.75*	6.25	6.25	8.75
Carwheels, Chicago	*5.50*	6.25	6.50	10.00
Carwheels, Philadelphia	*8.00*	9.00	9.00	12.00
No. 1 cast, Pittsburgh	9.00	9.00	9.25	10.25
No. 1 cast, Philadelphia	8.00	8.00	8.00	11.50
No. 1 cast, Ch'go (net ton)	*6.00*	6.50	6.50	9.00
No. 1 RR. wrot., Phila.	8.50	8.50	8.50	10.00
No. 1 RR. wrot., Ch'go (net)	3.75	3.75	4.25	7.00

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$2.00	$2.00	$2.25	$2.40
Foundry coke, prompt	3.00	3.00	3.00	3.50

Metals

	Cents	Cents	Cents	Cents
Per Lb. to Large Buyers:				
Lake copper, New York	5.50	5.50	5.75	8.37½
Electrolytic copper, refinery	5.12½	5.12½	5.12½	7.75
Tin (Straits), New York	*19.00*	19.87½	20.37½	22.75
Zinc, East St. Louis	*2.80*	2.82½	2.30	3.40
Zinc, New York	*3.17*	3.19½	2.67	3.75
Lead, St. Louis	2.90	2.90	2.90	3.60
Lead, New York	3.00	3.00	3.00	3.75
Antimony (Asiatic), N. Y.	5.12½	5.12½	5.30	6.05

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

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▲▲ The Iron Age Composite Prices ▲▲▲

	Finished Steel	Pig Iron	Steel Scrap
June 14, 1932	2.087c. a Lb.	$14.01 a Gross Ton	$7.00 a Gross Ton
One week ago	2.087c.	14.01	7.17
One month ago	2.087c.	14.22	7.62
One year ago	2.102c.	15.63	9.50
	Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1932	2.087c., Mar. 29	2.037c., Jan. 19	$14.81, Jan. 5	$14.01, June 7	$8.50, Jan. 12	$7.00, June 14
1931	2.142c., Jan. 13	2.052c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.362c., Jan. 7	2.121c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.412c., April 2	2.362c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.391c., Dec. 11	2.314c., Jan. 3	18.50, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.453c., Jan. 4	2.293c., Oct. 25	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22
1926	2.453c., Jan. 5	2.403c., May 18	21.54, Jan. 5	19.46, July 13	17.25, Jan. 5	14.00, June 1
1925	2.560c., Jan. 6	2.396c., Aug. 18	22.50, Jan. 13	18.96, July 7	20.83, Jan. 13	15.08, May 5

Pittsburgh District Steel Demand Undergoes No Further Decline

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Pittsburgh steel plants experience no further contraction in demand.

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Ingot output remains at 16 per cent. A rise in Youngstown district and a decline at Wheeling occur.

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Finishing mill schedules in some instances are better than ingot production.

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PITTSBURGH, June 14.—Steel demand in this district has shown no further contraction in the last week, although sheets, tin plate and strip steel are barely holding their own. Well sustained movement of structural steel is offsetting declining tendencies to some extent in other lines. Releases from the important consuming industries show very little change, although shipments to automobile makers, other than the Ford Motor Co., are tending downward. Sentiment in the market continues fairly good, although the attitude held in some quarters is based on the supposition that business can hardly get much worse rather than upon the expectation of a definite change.

Steel ingot production in the Pittsburgh district is unchanged at approximately 15 per cent of capacity, but production at Youngstown and other northern Ohio plants, outside of the Cleveland district, has risen to 20 per cent. The improvement is occasioned largely by resumption of production at a large Steel Corporation unit which has been inactive for three weeks. On the other hand, Wheeling district production is lower at 35 per cent of capacity. Finishing mill schedules in Pittsburgh and tributary districts average a little higher than steel-making operations, although pipe, plates and bars compare unfavorably with other products. Tin plate output is still holding at close to 50 per cent, although some mills are not doing this well.

With quoted prices for third quarter unchanged in most lines, smaller users of steel are in no hurry to place forward contracts. The larger consumers, however, are faced with the prospect of an advance in price over what they paid in the second quarter, as steel companies are anxious to bring complete stability to the quoted levels. In most cases low-priced contracts will run out on June 30, and this date has been set for cancellation for much business which is not specified prior to that time. A change in pickling extras on hot-rolled and hot-rolled annealed sheets has been announced as part of the program to bring stability to the sheet market.

Pig Iron

No important business has been reported in the last week. No action has been taken against a large inquiry for Bessemer iron which has been before the trade for several weeks. Occasional sales of Bessemer and malleable iron at $15, Valley furnace, are reported, while the foundry iron market is rather clearly defined at 50c. less. The Pittsburgh district furnace is quoting all three grades at $15.50. No business to test the price of basic iron is reported.

Semi-Finished Steel

In the absence of buying for third quarter, the price on billets, slabs and sheet bars has not been clearly established in this district. Mills continue to quote $28, Pittsburgh or Youngstown, which represents an advance of $2 a ton over the current market. Forging billets are well sustained at $33, and wire rods are holding at $37.

Rails and Track Supplies

Very little tonnage is being released by the carriers, June specifications for accessories having fallen well under May levels. Rail purchases are entirely lacking. Light rails are very dull, and prices are weak.

Bolts, Nuts and Rivets

Although makers have opened their books for third quarter at unchanged prices, little business has been placed. Specifications are scarcely equaling the low May rate.

Bars, Plates and Shapes

Structural awards are still making a fair showing, and new inquiry continues to come out. Local structural fabricators have added to their backlogs considerably in the last 30 days, but some of the material on their books is slow to be released. A highway bridge at Rochester, Pa., will require 1400 tons of shapes. Demand for reinforcing bars is rather disappointing for this time of the year and shows no improvement over May levels. Plates continue to be the most inactive of the heavy hot-rolled products. Orders for miscellaneous river craft are being placed from time to time, but no outstanding awards are reported. Pittsburgh mills are sharing in orders for 1200 tons of plates for the Wheeling & Lake Erie freight cars placed a short time ago. Tank work is very quiet. Both merchant and alloy steel bars are reflecting the lower requirements of the larger automobile companies.

With no advance in prices for third quarter, mills are concentrating their attention on old accounts which have not yet been advanced to the 1.60c., Pittsburgh, levels. It now appears likely that this figure will be rather generally applied on third quarter tonnage.

Cold-Finished Steel Bars

Third quarter contracts are coming in slowly, but buyers are gradually being converted to the new one price basing system. Specifications against old contracts must be in before June 30, but this circumstance has not stimulated releases very much as yet. The base price of 1.70c., Pittsburgh, applying to lots of 10,000 lb. or more of a size and grade, released for shipment at one time to one destination, is firm on new business.

Tubular Goods

With the exception of a fair movement of drilling pipe to the east Texas field, the market on tubular goods continues extremely dull. Only one or two definite line pipe inquiries are before the trade, and these are slow to be acted upon. Inquiry for mechanical tubing has been slightly heavier in the last week.

Wire Products

Merchant wire products are very quiet as this is the busy season in the agricultural district. Crop reports are very encouraging, and as jobbers' stocks are very low a fair demand is expected after crops are harvested. Specifications for manufacturers' wire this month are not up to the low May level. Prices are unchanged at 2.20c.

a lb., Pittsburgh, for manufacturers' wire, and $1.95 a keg for nails.

Sheets

Scattered business from the automobile industry is still benefiting sheet mills in this and nearby districts, but aggregate releases last week were at the lowest rate of the year. Production fell under 20 per cent of capacity, and may be even lower this week. With prices on the common finishes unchanged for the third quarter, the market shows signs of stability, and recent shading of hot-rolled annealed sheets seems to have disappeared.

New extras for pickling on hot-rolled and hot-rolled annealed sheets have been announced by several producers and reflect downward revisions of $1 to $2 a ton. On dry material, No. 12 gage and heavier, the extra has been lowered from 25c. to 15c.; on 13 to 16 gage, from 25c. to 20c.; on 17 to 21 gage, from 35c. to 25c., and on 22 gage and lighter, from 45c. to 35c. These extras are all subject to the usual 10c. additional charge for oiling and liming. The changes are designed to correct certain discrepancies in selling prices which have been in existence for some time.

Tin Plate

Releases are scarcely sufficient to maintain the present operating rate of about 50 per cent of capacity in the industry as a whole. One or two large companies are running at as low as 33 per cent, and few are above 50. The can companies show little disposition to increase their releases, and it is possible that the tin plate industry has reached its peak demand for the year.

Strip Steel

Pittsburgh district mills are not sharing sufficiently in the current automobile tonnage to make for much of a gain in their operations. Other lines are very dull, and small orders predominate. Production of hot-rolled strip is holding around the 20 per cent level, while cold-rolling units are even less busy. The single base price on hot-rolled strip has naturally not been tested, but practically all of the producers have issued new cards of extras, and the plan will soon be generally in force. A base price of 1.50c., Pittsburgh, will apply, although larger buyers will enjoy a concession of $1 a ton.

Scrap

No consumer purchases of the principal grades have been made in the last week, and market prices are nominally at unchanged levels. Dealers would undoubtedly be willing to sell No. 1 heavy melting steel at prices slightly under the present quoted range, but mills show no disposition to buy, and the market can be said to be held up by a lack of demand. Recent sales of heavy breakable cast have established quotations on a slightly higher level. Most other grades of scrap are weaker, as shipping points are lacking and primary dealers are unable to dispose of their stocks.

Coke and Coal

No new business is reported, and shipments of coke are lower than they were last month. The furnace grade is particularly quiet, and prices are weak, but furnace coke is still quotable at $2 to $2.25, Pittsburgh, and the foundry grade at $3 to $4.25.

Naval and Army Officers Win Lincoln Welding Prizes

THE first prize of the second Lincoln arc welding prize competition, sponsored by the Lincoln Electric Co., Cleveland, was awarded to Lt. Com. Homer N. Wallin and Lt. Henry A. Schade, United States Navy, and the second prize went to Maj. G. M. Barnes, United States Army. Approximately 400 papers were submitted in the competition, and the awards were made by a jury headed by Prof. E. E. Dreese of Ohio State University.

The naval officers received the first prize of $7,500 for a joint paper on "The Design and Construction of an Arc Welded Naval Auxiliary Vessel." At the time they submitted the paper they were members of the construction corps at the Navy Yard, Mare Island, California. Major Barnes, who is chief of design and engineering, ordnance department, Watertown Arsenal, received the second prize of $3,500 for his paper on "Manufacture of Ordnance at Watertown Arsenal Revolutionized Through Arc Welding."

"The Application of Arc Welding to the Design of Steel Buildings for the Resistance of Earthquake Forces," a paper by H. H. Tracy, structural engineer, Southern California Edison Co., Ltd., Los Angeles, won third prize of $1,500. A $750 fourth award went to Gustav F. D. Wahl and Harry E. Johns, Kiel, Germany, for a paper on a special river-sea bulk cargo ship. H. J. L. Bruff, Harrowgate, England, won fifth prize of $500 for his discussion of "Strengthening Weak Iron and Steel Bridges by Arc Welding." A paper on arc welding steel cars won $250 for W. H. Zorn of Wyandotte, Mich. Thirty-five additional prizes of $100 were awarded to authors of papers showing savings made possible by application of arc welding.

"Writes" Steel Check

The first three prize winners received what are believed to be the most unusual checks ever issued, the checks for the $7,500, $3,500 and $1,500, respectively, being "written" on sheet steel ⅛-in. thick, 24 in. long and 10 in. wide. Welding operators in the Lincoln plant relieved the treasurer's office of the detail of filling out the checks. All information including the date, amount, payee, and name of the bank was arc welded. The checks were signed by J. C. Lincoln, chairman of the board, and J. F. Lincoln, president, by the arc welding process, and the prize winners will indorse the checks by same method.

WINNERS of the first, second and third prizes of the second Lincoln arc welding competition were presented with steel checks "written" by the arc welding process. These checks, believed to be the first of their kind, will be indorsed by the same novel method.

A temperature signal device for determining temperature by means of electric lights and known as the "Thermo-tel" has been developed by the Uehling Instrument Co., Paterson, N. J. The instrument consists of different colored electric lights, actuated by changes in temperature. When the temperature is within the limits for which the instrument is set, a white light will illuminate; when the temperature is above the limits, a red light will illuminate, and when the temperature is below the limits, all lights will be out. Thermo-tel temperature signals are claimed to be accurate to within less than one-tenth of one degree Fahrenheit, and can be read at a distance of 200 ft. or more.

Chicago Ingot Output 18 Per Cent; New Business Is Not Promising

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CHICAGO, June 14.—Support is lacking in this market, and ingot output has dropped to about 18 per cent of capacity. New buying of finished steel products remains quiet, and the outlook is not promising. Specifications in all products but rails show only a moderate drop, but their character is such that rolling schedules are extremely difficult to arrange. Open-hearths in service on the first of the week are quite often carried through the period, although ingots must be put on the bank. Under present conditions open-hearth production is not a true indicator of rolling mill output.

Prices are not of major consideration, for the reason that it is generally believed that present quotations will be carried into the third quarter. In fact, some mills are already taking tonnage for delivery in July. Hot-rolled strips are rapidly going on a single base quotation.

The scrap market is demoralized and does not appear to have touched bottom in the opinion of leaders in the industry.

With the exception of the Northern Pacific, there seems to be no interest in rails, and rolling programs continue to dwindle and may cease entirely by the end of June.

Steel buying restricted and scarcely supports present 18 per cent ingot output.

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Rail rolling may cease at the end of June.

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Scrap market demoralized as prices again decline.

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Pig Iron

Shipments of Northern foundry iron so far in June are at about the May rate, but there is some doubt as to how well this rate will be sustained during the remaining days of the month. New buying is very dull. Prices, which are somewhat nominal as applying to fair or large-size tonnages, are not getting real tests. Dock iron is moving slowly and usually at prices below current quotations on district iron. A few small lots of silvery have been placed in recent days.

Reinforcing Bars

Private work appears to be lighter, and dealers are finding it necessary to concentrate almost wholly on public jobs. Illinois has recently opened bids on 500 tons for road work and will open new bids on 600 tons early next week.

Hot-Rolled Strip

Some sellers have already distributed and others are now about ready to issue new cards showing a single base price of 1.60c. a lb., Chicago. Demand has eased slightly, and output now averages 22 per cent of capacity.

Cast Iron Pipe

Milwaukee is expected to come into the market at an early date for a large tonnage of 24 and 36-in. pipe. This project constitutes the only one of size on which the trade will soon be figuring. Kingsford, Mich., is asking for a small tonnage, and Oshkosh, Wis., has closed for some miscellaneous pipe for a sewage plant and a pumping unit. Quiet has settled down over most of the Middle West, and the strain is telling on the price structure. Wilmette, Ill., has not been able to sell its water plant bonds and the project is being tabled for the time being.

Wire Products

Output has receded to 20 per cent of capacity as manufacturer and jobber demand both decline slowly. Concrete reinforcement mesh is moving in fair quantities, but not in proportion to active road work which was planned earlier in the year. The outlook for crops in the Northwest is excellent, but in the central Mississippi Valley lack of rain is a serious hindrance to early crop development. Prompt shipment of small and odd lots from mills is restraining jobbers from rounding out stocks.

Rails and Track Supplies

This market is very quiet, though it is probable the Northern Pacific may buy a small tonnage of rails to be taken before the close of navigation. Chicago rail mills are all but idle and schedules will not last to the end of June. There is little change in the movement of track supplies.

Sheets

Output is under 20 per cent of capacity and schedules are very irregular. Price announcements have not been made for third quarter, but it is generally understood that present quotations will be carried forward.

Bars

Bar specifications are lighter, with the main support coming from automobile manufacturers. Ford output continues to climb, and Auburn has stepped up its production schedule. The iron bar market is dull. Orders for rail steel bars are light and irregular.

Structural Material

The Missouri Pacific has placed an order for bridges. The Illinois Central is taking figures on about 400 tons. Railroad work of this kind is not important as to tonnage, but is noteworthy because of its absence from the market for so many months. Both new inquiries and sales are light.

Plates

An order for oil storage tanks has brought 1100 tons of new plate business to Chicago mills. Otherwise the market is dull. Work in railroad shops is becoming more spotty; the North Western has reduced its force, but several other Western railroads have added men.

Bolts, Nuts and Rivets

The one active farm implement manufacturer in this district will take inventory in July and is now lowering acceptances of these commodities. June shipments continue to drop away from the low level established in May. Contracting for the third quarter is making fair headway.

Scrap

Sales are so scarce that there is no definite way in which prices can be determined. Dealers are all alike in their efforts to sell and they are offering most grades at 50c. to 75c. a ton below recent quotations. Brokers are paying little attention to railroad lists and some of these offerings are being made direct to consumers, though without much success. Mill acceptances of heavy melting steel are very light, and it is quite evident that these users are attempting to liquidate stocks of scrap. Old contracts still look formidable in view of the current rate of consumption.

Eastern Pennsylvania Trade Continues in a Deep Rut

Pennsylvania Railroad Work the Outstanding Prospect, But Some Steel Has Already Been Rolled

PHILADELPHIA, June 14.—The market continues listless, and no indications of improvement through the summer are in sight. Operations have declined one point to 13 per cent. Despite the low ebb of business, however, the price structure is being well maintained and is the one bright spot in the situation. Prices on plates and sheets for the third quarter have been reaffirmed on the basis of second quarter level and similar action is expected shortly with regard to quotations on bars and shapes.

The Pennsylvania Railroad is expected within a few days to announce releases for steel in connection with its electrification and terminal improvement work. Virtually all of the steel for electrification, however, has been rolled, and releases for this phase of the work will be light. Consideration for immediate release relates to the viaduct at Newark, N. J., calling for 1900 tons of structural and unless plans are changed the first announcement will cover this project, with releases following for other work at Newark, including a passenger station, calling for 2100 tons. In all, work at Newark will involve about 14,000 tons. Transmission poles will take 37,000 to 40,000 tons, and cross arms call for about 5000 tons. Of these tonnages 60 to 70 per cent has been released previously, so that new releases will be small for this work. Completion of the project may be carried further into the future than had been contemplated.

Pig Iron

The market has softened and now is quoted at a flat price of $14, furnace, for No. 2 foundry iron. Only carlots are moving. There is a small amount of forward buying of special grades. Few specifications have been placed for light lots of standard ferromanganese at the new level of $68, seaboard.

Plates, Shapes and Bars

The price of 1.70c., Coatesville, for plates for third quarter has been announced. This is a reaffirmation of the second quarter level and like action is expected shortly on shapes and bars. Demand is extremely dull, but prices are being well maintained.

Warehouse Business

Jobbers have advanced the price of cold-finished steel bars $4 a ton, established at 3.10c. a lb., base, Pittsburgh, plus 40c. freight rate, making 3.50c. for rounds and hexagons, with a 50c. higher base for flats and squares, making 3.60c., base, or 4c., Philadelphia. Quantity extras, per 100 lb., are: Under 300 lb., $1.25; 300 lb. to 499 lb., 75c.; 500 lb. to 999 lb., 25c., and for 1000 lb., none. Extras also apply for sizes, including $6 on flats wider than 6 in.

Imports

Imports at Philadelphia last week included 1115 tons of structural shapes, 36 tons of flat and rolled bars and five tons of band steel from Belgium and 409 tons of pig iron from India.

Scrap

The market remains quiet. Old hydraulic compressed steel, machine shop turnings and heavy breakable cast have moved in small lots at a decline of 50c.

Cincinnati Pig Iron Orders Gain Slightly

CINCINNATI, June 14.—Carload pig iron orders and contract releases increased moderately the past week. Current business is for rush shipment and results from a few automobile orders distributed among some district foundries. Machine tool foundries are still without noticeable business. Prices are unchanged.

Steel

A slight gain in orders for automotive and refrigerator companies the past week enabled district sheet mills to maintain rolling schedules at near 30 per cent of capacity.

Scrap

With the market sluggish, scrap prices are nominal.

St. Louis Scrap Prices Undergo Further Decline

ST. LOUIS, June 14.—This was another quiet week in the pig iron market. Shipments against contracts are said to be well maintained. Prices are unchanged and apparently firm, although insufficient business is being offered to test the market.

Steel

Information has been received here that the Texas State Highway Commission has adopted a rule prohibiting the use of more than 15 per cent of foreign steel in the construction of highways in which imported materials had been largely used. The award of 800 tons by the Missouri Pacific for a bridge at Myrtle, Ark., went to Stupp Brothers Bridge & Iron Co.

Scrap

An East Side melter bought 2000 tons of No. 2 heavy melting steel at $5, which was $1 less than was paid the preceding purchase. Reductions in dealers' prices on that and nearly every other item in the list have followed. The price reductions range from 50c. to $1.25 a ton. Because of the inactivity of the market, all prices are nominal.

Railroad lists: Southern, 9400 tons; Missouri Pacific, 5000 tons; Alton, 1000 tons; Gulf Coast lines, 325 tons of axles; Pullman Co., St. Louis, four carloads; Standard Oil Co. (Woodriver), two carloads.

Canadian Blast Furnace Blown In; Three Active

TORONTO, June 13.—Plants are maintaining operations at an average rate of about 35 per cent of capacity, but are relying on hand-to-mouth orders to keep going. Very little future buying has been done this year in any line. Building trades are at a standstill. Structural steel awards have been light.

The Dominion Steel & Coal Corpn., Sydney, N. S., which has recently closed a rail order, is preparing to start rolling. The company has blown in a blast furnace; three of 11 furnaces in Canada are now active. The Algoma Steel Corpn. is cutting rail production and shutting down this department, but is still busy in its merchant mills. The Steel Co. of Canada, Ltd., Hamilton, is running at a reduced rate in all departments with very little in the way of backlogs.

Pig Iron

Business in this market is holding at a fair level. Melters are buying for spot only but are entering the market at regular intervals. Weekly sales are holding around 500 tons, made up of single car lots and occasional orders up to 100 tons. No future booking has been reported, although it is understood that the Algoma Steel Corpn., will be shipping iron by the Lakes to the Toronto district this year.

Scrap

General stagnation rules in this market. Business is specialized and only a few special grades are moving. Steel mills are out of the market, with the result that heavy melting steel and turnings are stagnant.

Some Spotty Gains in Steel Bookings in New York Market

Improvement May or May Not Have Significance—New Extras On Hot-Rolled and Hot-Rolled Annealed Sheets

NEW YORK, June 14.—A few steel companies experienced a better demand for their products in this territory in the past week, but there was nothing to indicate that this improvement would extend into this week. Steel companies scarcely know from one day to another what orders they may expect. It is possibly of some significance that orders have been received from consumers that have not been taking steel in some time.

New price schedules on sheets for the third quarter include reductions in pickling extras on hot-rolled and hot-rolled annealed sheets. No. 12 and heavier will carry an extra of 15c. per 100 lb. instead of 25c.; No. 13 to 16, 20c. instead of 25c.; Nos. 17 to 21, 25c. instead of 35c., and No. 22 gage and lighter, 35c. instead of 45c. There will also be an extra of 10c. per 100 lb. for oiling and liming.

Makers of bars, shapes and plates are extending current prices into the third quarter.

Pig Iron

Inquiry is apparently holding the slight gain experienced a week ago. The A. P. Smith Mfg. Co., East Orange, N. J., has entered the market for its third quarter requirements, consisting of 150 tons each of No. 2 and No. 2X foundry iron. Several other small lots are also up for negotiation. Sales in the past week amounted to about 1500 tons, compared with a similar quantity the week before and 1000 tons two weeks ago. Offering of a lot of iron for resale at relatively low prices has not aided the general price structure.

Reinforcing Bars

Demand continues to lag. Notwithstanding the dearth of new business, however, prices are firmly held at 1.60c., Pittsburgh, or 1.95c., New York. A section of the Grand Central Parkway in Queens will take about 100 tons. The only sizable award in the past week was 500 tons for a warehouse in Brooklyn.

Scrap

Continued lack of interest in all grades has caused further weakness. In the absence of significant trading in the past week, however, the list is nominally unchanged, with the exception of No. 1 heavy melting steel, which is now procurable at $4 a ton, on barge.

Alabama Steel Output Very Low; Cast Iron Pipe Plant Idle

BIRMINGHAM, June 14.—Pig iron business is being governed entirely by current requirements, which are hardly maintaining even the low rate of the past few months. Foundries are taking no chances either as to stocks of pig iron or stocks of finished goods. Depleted stocks are not being replaced and work is being done only on orders that are actually booked. In the midst of what is usually their most active season the pipe plants have almost reached the point of stagnation. One of the largest plants, that of the National Iron Pipe, is idle for about 30 days. The American Cast Iron Pipe Co. is working only a few days in alternate weeks, and schedules of the others are more or less in line with these. Demand from the stove foundries has also receded, and is said to be worse than 30 days ago. The price of $11 is holding for the Southern market. Four blast furnaces remain in production, the same as for some weeks. Republic Steel has changed its No. 1 furnace from high silicon to foundry and basic.

Steel

Outside of Government projects, local fabricators have very few prospects, and their current bookings are made up almost entirely of such business. The Virginia Bridge & Iron Co. has booked 1100 tons for the Chattanooga Post Office, and its orders for other Federal projects during recent weeks have totaled several thousand tons. Reinforcing bar tonnage, however, has not been in keeping with that in structural steel.

A reduction of $5 per ton to $48, base, Birmingham, was made last week on hay bale ties. Other prices for wire products remain the same.

Open-hearth operations are at a low point. The Tennessee company is operating four at Fairfield. The open-hearth plant of Gulf States Steel was idle last week and will be idle also this week.

Scrap

A few changes have been made in prices, but these are not indicative of any change in market conditions. There is practically no demand and price quotations are only nominal.

Pacific Coast Tonnage and Prices Improving

SAN FRANCISCO, June 13.—Further calls for bids and releasing of specifications on public projects are keeping Pacific Coast estimators busier than at any time this year. Award of more than 3000 tons of shapes and bars on major contracts during the past week continues the improvement that has characterized the past 30 days.

Steel distributers in the Pacific Northwest have increased their warehouse schedules 25c. per 100 lb. in line with recent firming of mill prices and consistent with previous advances by California jobbers. Prices are reported being maintained, reflecting the general resolution to overcome profitless or loss operations.

Reported awards of reinforcing bars were in excess of 1250 tons, with new inquiries for 1800 tons. More than 1700 tons of structural shapes was placed, and future requirements for 750 tons are entered. Bids will be opened at Denver on 52,000 to 60,000 tons of plates for tunnel lining and pipes at Hoover Dam. Seattle plans to take bids in July on water front improvements on Railroad Avenue, involving 1800 tons of sheet steel piling, 550 tons of reinforcing bars and 950 tons of cast iron pipe.

New England Pig Iron Business Very Meager

BOSTON, June 14.—Business in pig iron continues on a very limited scale, sales the past week amounting only to a few hundred tons. More Indian iron was sold than any other one brand. Dutch iron has not figured in recent transactions to any extent. No. 2X Indian iron sells generally at $16 to $16.50 a ton, on dock Boston, duty paid, but where the freight rate is small $17 a ton is quoted. The New England melt of iron holds at about 10 per cent of rated capacity.

Scrap

The movement of scrap is still light, and very largely confined to scattered carlots of textile and No. 1 machinery cast for New England as well as Pennsylvania consumption. There is no indication that business will pick up this month.

Cleveland Ingot Output Lower; Ford Purchase Expected Soon

Automobile Manufacturer May Buy Sheets Soon—Demand for Bars, Shapes and Plates Improves Slightly

CLEVELAND, June 14.—Conditions in the steel industry are spotty, but sentiment shows some improvement. Demand for bars, plates and shapes is slightly better than last month. Orders are coming from miscellaneous sources in small lots. Sheets and strip steel are showing little activity. Specifications for the latter have declined because of the rather general slowing down of the motor car industry, aside from the Ford plant. Increased production by the Ford company is not of much help to the bar mills, as the Ford steel plant is supplying most of the bar products used in Ford cars.

Steel plant operations in Cleveland were reduced three points this week to 29 per cent of ingot capacity by the taking off of one open-hearth furnace. Some tonnage is expected to be driven out during the month in products that are put on a slightly higher price basis for the coming quarter. These include black sheets, for which some consumers were able to make second quarter contracts below the regular 2.20c. price and on such sizes in hot-rolled strip that will be higher under the new single price base and revised extras. Renewed attempts have been made in some cases by motor car manufacturers to secure new price concessions.

Additional producers, including a Cleveland mill, have reestablished the 1.65c., Cleveland, and 1.60c., Pittsburgh, prices on steel bars for the coming quarter, and leading mills, while not making official announcements, have reaffirmed plates and shapes for that delivery at 1.60c., Pittsburgh, by making commitments at current prices. Reinforcing bars have been reestablished at 1.50c., Cleveland.

Consumers are showing no interest in sheets or strip steel for the coming quarter.

Iron Ore

No open market business has developed since the reestablishment of last season's prices. The vessel rates for carrying ore on the Great Lakes, which have prevailed for several years, have been reestablished. These are 70c. a ton from the head of the Lakes to lower Lake ports, 63c. from Marquette and 52½c. from Escanaba. Dock shipments continue light. Shipments from Lake Erie docks were 65,137 tons in May, against 769,436 tons during the same month last year. Receipts were 39,406 tons, against 598,843 tons in May last year. Receipts last month at Lake Michigan ports were 79,270 tons, against 656,135 tons in May last year. The dock balance June 1 was 5,533,245 tons, against 5,147,102 tons June 1 last year.

Pig Iron

The market shows little life, although one merchant furnace interest reports its sales this month at 25 per cent ahead of those of the corresponding period of May and shipments slightly better. Buying is confined to small lots for immediate requirements. Some recent 500-ton inquiries have resulted in orders for only 50 tons. In this immediate territory there is practically no new business. Operation of jobbing foundries shows no gain. Prices, while untested, are being maintained on small sales. For local delivery, foundry and malleable iron is quoted at $15.50, furnace. For out-of-town shipment, $14.50 is the ruling maximum quotation.

Bars, Plates and Shapes

Quite a little structural inquiry is coming out for small lots, largely for bridges. Demand for merchant steel, alloy and reinforcing bars is slow. Not much business is coming from the motor car industry to forge shops and other makers of automobile parts in this territory. Prices are steady.

Semi-Finished Steel

While several producers have announced a $2 a ton advance to $28, Cleveland and Youngstown, on sheet bars, billets and slabs for the coming quarter, it seems doubtful if the advance will be placed in effect. One producer has rescinded its action to the extent that at present it is not quoting a third quarter price.

Sheets

Following the announcement by some of the mills of the reestablishment of current prices for the third quarter, most other makers have reaffirmed the same prices. Business continues light from all sources. There is some expectation of new buying by the Ford Motor Co. this week. A revision downward will be announced shortly in pickling extras on some gages of hot-rolled and hot-rolled annealed sheets.

Strip Steel

Additional producers have named a 1.45c., Pittsburgh, base price for the third quarter for hot-rolled strip in all widths. Some mills will accept specifications against old contracts until July 1 for shipments up to Aug. 1. Plants of some of the leading makers of automobile parts have curtailed production, and specifications from these sources have declined. Cold-rolled strip remains inactive, with the price steady at 2c., Cleveland. Fender stock has been established for the third quarter at 2.90c., the price that has been rather commonly quoted recently.

Scrap

No new demand has developed this month. Shipments during the week were limited to a few cars. Prices have further declined on several grades, and the market is still weak. Producers having scrap that they are anxious to move are selling it for almost any price they can get and this is going into yard stocks.

Only Three Blast Furnaces Active at Buffalo

BUFFALO, June 14.—Only three blast furnaces in this district are active. The Lackawanna plant of Bethlehem Steel has reduced to one furnace; the Hanna Furnace Corpn. is operating one and Republic Steel one on reduced blast. Pig iron bookings so far in June are ahead of those of the same period in May.

Steel

Bethlehem continues to operate three open-hearth furnaces at Lackawanna. Republic started three furnaces on Sunday and expects to operate them until next Saturday. It is reported that bids will soon be asked for about 2000 tons of structural steel for the new Sisters' Hospital. The reinforcing bar situation is slightly better with a few jobs in prospect for the next few weeks.

Scrap

A sale is noted of a small tonnage of No. 2 busheling at $4. A mill which recently took some shipments of No. 2 heavy melting steel is expected to release soon the small balance on its contracts.

Detroit Scrap Market Weak; Quotations Lower

DETROIT, June 14.—Heavy melting steel has declined 25c. a ton, and is now selling at $4.50 to $5. Other items also are weak, being off 25c. to 50c. a ton. A small boatload of cast iron scrap is moving out of here to Buffalo this week.

Members of the Electric Hoist Manufacturers Association report that the number of hoists ordered during May decreased 27 per cent as compared with the previous month, and the value of such orders decreased 30 per cent. Shipments were 18.6 per cent smaller in May.

British Raise Tariff on Pig Iron, Ingots, Spring Steel

Lower Duties on Wrought Charcoal Bars and Strip Steel—Belgian Mills Further Reduce Output

LONDON, ENGLAND, June 13 (*By Cable*).—The British Tariffs Advisory Committee recommended that the duties on pig iron, ingots, stampings, pressings, castings, 7 lb. and over, and spring steel, be raised from 10 per cent to 33⅓ per cent. It also recommended that the duties on wrought iron bars produced by puddling with charcoal from pig iron smelted wholly with charcoal and on rolled strip over 10 in. wide in coils not over 3 cwt. (336 lb.) be reduced from 33⅓ per cent to 10 per cent. All these changes are to be effective from midnight Monday, June 13.

General trade conditions are unaltered, with consumers still buying from hand to mouth. The Continental market is stagnant, with buyers seeking lower prices, but some Belgian makers are further restricting their output in an endeavor to check the fall in prices. Mild steel bars are somewhat firmer, but beams are weaker.

Tin plate is quiet as a result of recent unsettled conditions in the tin market, but makers generally regard outlook as favorable. Present output is at 60 per cent but, in the absence of new business, will probably decline to between 50 and 55 per cent.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9 0s.		
Billets, open-hearth	4 17 6d	to £5 7s. 6d	
Black sheets, Japanese specifications	9 12 6		
Tin plate, per base box	14 9	to 15 3	
Steel bars, open-hearth	7 17½	to 8 7½	
Beams, open-hearth	7 7½	to 7 17½	
Channels, open-hearth	7 12½	to 8 2½	
Angles, open-hearth	7 7½	to 7 17½	
Black sheets, No. 24 gage	8 0	to 8 10	
Galvanized sheets, No. 24 gage	9 5	to 9 7 6	

Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £ at $4.86

Billets, Thomas	£1 19s.	
Wire rods, No. 5 B.W.G.	4 10	
Black sheets, No. 31 gage, Japanese	11 5	
Steel bars, merchant	2 5	
Beams, Thomas	2 1 6d	
Angles, Thomas, 4-in. and larger	2 3	
Angles, small	2 5	
Hoops and strip steel over 6-in. base	3 5	
Wire, plain, No. 8	5 7½	
Wire, barbed, 4-pt., No. 10 B.W.G.	8 15	

In May the United Kingdom exported 6800 tons of pig iron, of which 215 tons was shipped to United States. The total exports of iron and steel in May were 151,000 tons.

Hanna Pig Iron Sales to Be Directed from Detroit

The Hanna Furnace Corpn., pig iron subsidiary of the National Steel Corpn., will establish sales headquarters in Detroit, and E. Kay Ford, who is the company's Detroit representative, will have charge of sales. This change is made as a result of the sudden death last week of Donald M. Eddy, vice-president of the company, who directed pig iron sales from Buffalo.

British Canning Industry Has Expanded Rapidly

WASHINGTON, June 14.—The rapid expansion of the British canning industry is indicated by the announcement just made by the Metal Box Co., Ltd., that its output of sanitary cans grew from 25,000,000 in 1930 to 65,000,000 in 1931 and that it anticipates producing not less than 100,000,000 during the current year, according to Trade Commissioner Floyd E. Sullivan, London. The company claims it is responsible for about 90 per cent of the total output of sanitary cans used by food canners in the United Kingdom. The report says that so far over £400,000 has been spent by the company and its subsidiaries for the erection and equipment of two modern plants. Patents and processes of the United States, it is declared, have been largely drawn upon.

Limestone Rates Are Reduced

WASHINGTON, June 14.—Effective Sept. 7, rates on limestone from Stephens City, Va., to steel plants and foundries in Maryland, Pennsylvania, West Virginia, Ohio and Delaware will be established on a parity with rates from Martinsburg and Engle, W. Va. Decision to this effiect was announced last Friday by the Interstate Commerce Commission in passing upon a complaint by the M. J. Grove Line Co., Stephens City. Among those intervening on behalf of the complainant was the Jones & Laughlin Steel Corpn. The commission held that the rates from Stephens City are not unreasonable, but are unduly preferential to competitors at Martinsburg and Engle to the extent they exceed rates from the latter two points of origin. Reducing the rates from Stephens City to a parity with those from Martinsburg and Engle will mean lowering the present rate of $1.66 per ton to $1.51 to Steubenville, Ohio, and Midland, Pa., while the rate of $1.90 to Warren and Youngstown, Ohio, will be cut to $1.76 and the rate of $1.40 to Pittsburgh will be reduced to $1.26.

Other new rates, compared with present rates, the latter in parenthesis, are: Baltimore, $1.13 ($1.26); Canton, Ohio, $1.96 (present rate not given); Lowellville, Ohio, Sharon, Pa., $1.76 ($1.90); Eddystone, Pa., $2.02 ($2.17); Glassport, Pa., $1.51 ($1.76); Johnstown and Monessen, Pa., $1.26 ($1.40); Follansbee and Weirton, W. Va., $1.51 ($1.66).

Reinforcing Steel

Awards 4200 Tons—New Projects 5600 Tons

AWARDS

Brooklyn, 500 tons, Sears, Roebuck & Co. warehouse, to Rawlins Co., New York.

South Philadelphia, 100 tons, addition to high school, to Gilmore Steel Products Co., Philadelphia.

Washington, 1240 tons, Post Office Department building, to Sweet Steel Co., Williamsport, Pa.

Edmundson County, Ky., 118 tons, bridge, to Dudley Bar Co.

Mobile, Ala., 125 tons for Swift & Co., to Gulf States Steel Co.

State of Wisconsin, 200 tons, paving, to Concrete Engineering Co.

State of Indiana, 700 tons, road work, to unnamed bidder.

Chicago, 175 tons, General Motors Building for World's Fair, to an unnamed bidder.

San Francisco, 190 tons, Telegraph Hill monument, to Soule Steel Co.

Los Angeles, 475 tons, Firestone Boulevard bridges, to Pacific Coast Steel Co.

Jefferson, Ore., 315 tons, Santiam River highway bridge, to Soule Steel Co.

NEW REINFORCING BAR PROJECTS

Boston, 2000 tons, Huntington Avenue subway.

State of New York, 100 tons, section 6A, part 2, Grand Central Parkway, Queens.

New Orleans, 275 tons, Charity Hospital, bids opened June 13.

State of Illinois, 600 tons, highway work.

Minneapolis, 500 tons, post office.

State of Indiana, 400 tons, bridges.

Ventura, Cal., 595 tons, two highway bridges; bids close June 29.

Del Mar, Cal., 330 tons, highway crossing over Santa Fe Railway; bids close June 29.

Seattle, 550 tons, Railroad Avenue seawall.

State of Oregon, 201 tons, highway bridges in various counties; bids close June 23.

Railroad Equipment

Midland Continental has ordered one 60-ton gas-electric locomotive from Whitcomb Locomotive Co., subject to approval of Interstate Commerce Commission.

North Western Railways, Ltd., Lahore, India, is asking bids until June 27 for nine locomotives and 25 locomotive boilers.

Copper Tariff May Have No Effect Immediately on Prices; Markets Quiet

NEW YORK, June 14.—The more optimistic outlook that has pervaded the London copper market, following reports from the Lausanne conference that a tentative agreement had been reached to help to untangle the mesh of European trade difficulties, has not been extended to the domestic market. Demand here for electrolytic metal continues to be listless. Large fabricators are passive to current offerings of 5⅝c. a lb., delivered Connecticut Valley, which basis prevailed throughout the past week. Although sales have been made at 5.50c., delivered, for fourth quarter, business for extended delivery has not reached important volume. Foreign bookings in June have proved particularly disappointing, the total thus far amounting to only 2500 tons. Export metal is still being offered at the special posting of 5.50c., while Copper Exporters, Inc., continues to maintain an official price of 6.25c., c.i.f. usual foreign ports. With current activity practically marking time, both producers and consumers are centering their interest in the probable effects of the copper tariff on the price of domestic metal. There is little likelihood, according to certain leading interests, that prices will be influenced for some time. The abnormally large stocks of copper in this country, it is pointed out, are sufficient to satisfy the current low rate of domestic consumption for many months and should furthermore preclude drawing on foreign sources at least until American requirements expand to normal proportions.

Tin

The New York market has remained quiet throughout the past week. Fluctuations in the domestic price of tin were occasioned by unsettled conditions in the London market, which today was £113 5s. for spot standard, £115 10s. for future standard and £117 15s. for spot Straits. The Singapore market today was £121 5s. The afternoon market in London closed £3 15s. lower for both spot and future, and after the close of the market business was done at £111 for three months. United Kingdom warehouse stocks increased 101 tons last week to a total of 33,216 tons. Straits shipments up to and including June 11 totaled 1668 tons. Official announcement is expected shortly, covering the reported approval of Bolivia, Dutch East Indies, Federated Malay States and Nigeria of the plan to curtail tin production in these countries to one-third of the 1929 rate, and complete suspension of exports for two months.

Lead

Interest in lead is quiet. Prices are unchanged at 2.90c., St. Louis, and 3c., New York. With about 25 per cent of June consumer needs still uncovered, a steady amount of moderate buying is expected during the remainder of the month. About 40 per cent of July requirements has been placed, but prospects that lead sales in that month will compare favorably with June business are considered poor, in view of the suspension of operations that will be generally in effect at consumers' plants next month.

Zinc

Significant developments in this market are lacking. Current prices of 2.80c., East St. Louis, and 3.17c., New York, are slightly lower than the market a week ago, but the present position reflects a firm undertone. The firmness that characterizes the ore market, and further curtailment in zinc production are notably influential in improving the industry's statistical position.

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The Week's Prices. Cents Per Pound for Early Delivery

	June 8	June 9	June 10	June 11	June 13	June 14
Lake copper, New York	5.50	5.50	5.50	5.50	5.50	5.50
Electrolytic copper, N. Y.*	5.12½	5.12½	5.12½	5.12½	5.12½	5.12½
Straits tin, spot, N. Y.	19.50	18.60	19.32½	....	19.62½	19.00
Zinc, East St. Louis	2.82½	2.80	2.80	2.80	2.80	2.80
Zinc, New York	3.19½	3.17	3.17	3.17	3.17	3.17
Lead, St. Louis	2.90	2.90	2.90	2.90	2.90	2.90
Lead, New York	3.00	3.00	3.00	3.00	3.00	3.00

*Refinery quotation: price ¼c. higher delivered in the Connecticut Valley.

Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel, electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 5.12½c. a lb., New York.
Brass ingots, 85-5-5-5, 6.00c. a lb., New York and Philadelphia.

From New York, Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	22.00c. to 23.00c.
Tin, bar	24.00c. to 26.00c.
Copper, Lake	7.50c. to 8.50c.
Copper, electrolytic	7.25c. to 8.25c.
Copper, casting	7.00c. to 8.00c.
*Copper sheets, hot-rolled	14.87½c.
*High brass sheets	12.00c.
*Seamless brass tubes	15.25c.
*Seamless copper tubes	14.37½c.
*Brass rods	9.75c.
Zinc, slabs	4.25c. to 4.75c.
Zinc sheets (No. 9), casks	9.25c. to 9.50c.
Lead, American pig	4.00c. to 4.50c.
Lead, bar	5.75c. to 6.75c.
Lead sheets	7.50c.
Antimony, Asiatic	8.00c. to 9.00c.
Alum., virgin, 99 per cent plus	23.30c.
Alum. No. 1 for remelting, 98 to 99 per cent	16.00c. to 17.00c.
Solder, ½ and ½	14.75c. to 15.75c.
Babbitt metal, commerical grade	18.00c. to 28.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

Metals from Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	24.00c.
Tin, bar	26.00c.
Copper, Lake	6.50c.
Copper, electrolytic	6.50c.
Copper, casting	6.25c.
Zinc, slab	4.25c. to 4.50c.
Lead, American pig	3.75c. to 4.00c.
Lead, bar	7.25c.
Antimony, Asiatic	10.00c.
Babbitt metal, medium grade	14.50c.
Babbitt metal, high grade	28.00c.
Solder, ½ and ½	16.00c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	4.00c.	4.50c.
Copper, hvy. and wire	3.75c.	4.25c.
Copper, light and bottoms	2.875c.	3.625c.
Brass, heavy	1.75c.	2.25c.
Brass, light	1.25c.	1.75c.
Hvy. machine composition	2.75c.	3.25c.
No. 1 yel. brass turnings	2.00c.	2.50c.
No. 1 red brass or compos. turnings	2.50c.	3.00c.
Lead, heavy	2.00c.	2.50c.
Zinc	1.00c.	1.375c.
Cast aluminum	2.50c.	4.00c.
Sheet aluminum	6.50c.	8.00c.

The machine shop practice division of the American Society of Mechanical Engineers, under chairmanship of F. C. Spencer, Western Electric Co., will transfer its program which had been previously planned for the Machine Tool Show in Cleveland to the National Metal Congress at Buffalo during the week of Oct. 3. The Society of Automotive Engineers' program, originally planned for the Cleveland convention, has also been transferred to the Buffalo congress.

For handling sulphite liquors, phosphoric acid and other corrosives at rapidly changing temperatures, a new line of pumps, valves and fittings in the chrome-nickel alloy steels, Durimet, KA2S, KA2SMo and Alcumite (aluminum bronze) is being announced by the Duriron Co., Inc., Dayton, Ohio, in bulletin No. 514.

Prices of Finished and Semi-Finished Steel, Coke, Coal, Cast Iron Pipe

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.a.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c
Del'd Philadelphia	1.91c.
Del'd New York	1.95c.
Del'd Detroit	1.80c.
F.o.b. Cleveland	1.65c.
F.o.b. Lackawanna	1.70c.
F.o.b. Birmingham	1.75c.
C.i.f. Pacific ports	2.10c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.	1.60c.
F.o.b. Birmingham, mill lengths	1.75c.
F.o.b. Cleveland	1.50c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.20c. to 1.35c.
F.o.b. Chicago Heights mills	1.50

Iron

Common iron, f.o.b. Chicago	1.65c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.11c.
Common iron, del'd New York	2.15c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c.
Del'd Cleveland	1.8035c.
Del'd Philadelphia	1.7935c.
F.o.b. Coatesville	1.70c.
F.o.b. Sparrows Point	1.70c.
F.o.b. Lackawanna	1.70c.
Del'd New York	1.898c.
C.i.f. Pacific ports	2.00c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c.
F.o.b. Lackawanna	1.70c.
F.o.b. Bethlehem	1.70c.
Del'd Cleveland	1.8035c.
Del'd Philadelphia	1.6495c.
Del'd New York	1.86775c.
C.i.f. Pacific ports (standard)	2.10c.
C.i.f. Pacific ports (wide flange)	2.20c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago mill	2.05c.
F.o.b. Buffalo	2.00c.

Alloy Steel Bars

(F.o.b. maker's mill)

A.E. Series Numbers	Alloy Quantity Bar Base, 2.65c. per Lb. Differential per 100 Lb.
2000 (½% Nickel)	$0.25
2100 (1½% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.16 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	0.20
6100 Chromium Vanadium Bar	1.20
6100 Chromium Vanadium Spring Steel	0.95
9250 Silicon Manganese Spring Steel (flats)	0.25
Rounds and squares	0.50
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars, forging quality. The differentials for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a section area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Cold Finished Bars*

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	1.70c.
Bars, f.o.b. Chicago	1.70c.
Bars, Cleveland	1.70c.
Bars, Buffalo	1.70c.
Shafting, ground, f.o.b. mill	†2.05c. to 3.00c.

*In quantities of 10,000 lb. or more.
†According to size.

SHEETS, STRIP, TIN PLATE, TERNE PLATE

Sheets

Hot-rolled

	Base per Lb.
No. 10 f.o.b. Pittsburgh	1.55c.
No. 10 f.o.b. Chicago mill	1.65c.
No. 10 del'd Philadelphia	1.86c.
No. 10, f.o.b. Birmingham	1.70c.
No. 10, c.i.f. Pacific Coast ports	2.17½c.

Hot-Rolled and Annealed

No. 10, Pittsburgh	1.70c.
No. 10, Chicago mills	1.80c.
No. 10, Birmingham	1.85c.
No. 10, Pacific Coast ports	2.32½c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.20c.
No. 24, f.o.b. Chicago mills	2.30c.
No. 24, del'd Philadelphia	2.46c. to 2.51c.
No. 24 f.o.b. Birmingham	2.35c.
No. 24, c.i.f. Pacific Coast ports	2.85c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.25c.
No. 10 gage, f.o.b. Chicago mills	2.35c.
No. 10 gage, del'd Philadelphia	2.46c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.75c.
No. 20 gage, f.o.b. Chicago mills	2.85c.
No. 20 gage, del'd Philadelphia	3.06c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	2.85c. to 2.90c.

Steel Furniture Sheets

No. 10, f.o.b. Pittsburgh	2.65c.
No. 20, f.o.b. Pittsburgh	3.15c.

(Prices on furniture stock include stretcher leveling but not resquaring.)

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Chicago mills	2.95c.
No. 24, del'd Philadelphia	3.16c.
No. 24, f.o.b. Birmingham	3.00c.
No. 24, c.i.f. Pacific Coast ports	3.50c.

Long Ternes

No. 24, unassorted, 8-lb. coating, f.o.b. P'gh	2.80c. to 3.00c.

Vitreous Enameling Stock

No. 10, f.o.b. Pittsburgh	2.50c. to 2.60c.
No. 20, f.o.b. Pittsburgh	3.00c. to 3.10c.

Tin Mill Black Plate

No. 28 f.o.b. Pittsburgh	2.40c.
No. 28 Chicago mill	2.50c.

Tin Plate

	Base per Box
Standard cokes, f.o.b. P'gh district mills	$4.75
Standard cokes, f.o.b. Gary	4.85

Terne Plate

(F.o.b. Morgantown or Pittsburgh)
(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$9.50
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.10
30-lb. coating I.C.	14.90
40-lb. coating I.C.	16.70

Hot-rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, Pittsburgh	1.50c. to 1.60c.
Wider than 6 in., P'gh	1.40c. to 1.50c.
6 in. and narrower, Chicago	1.60c. to 1.70c.
Wider than 6 in., Chicago	1.50c. to 1.60c.
Cooperage stock, P'gh	1.60c. to 1.70c.
Cooperage stock, Chicago	1.70c. to 1.80c.

Cold-Rolled Strips

F.o.b. Pittsburgh	2.00c.
F.o.b. Cleveland	2.00c.
Del'd Chicago	2.30c.
F.o.b. Worcester	2.20c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	2.90c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland)

(After Dec. 31, extras of 10c. a 100 lb. on mixed and joint carloads, 25c. on pool carloads and 40c. on less than carloads will be applied on all merchant wire products.)

To Manufacturing Trade

Bright wire	2.20c.
Spring wire	3.20c.

To Jobbing Trade

	Base per Keg
Standard wire nails	$1.95
Smooth coated nails	1.95
Galvanized nails	3.95

	Base per Lb.
Smooth annealed wire	2.35c.
Smooth galvanized wire	2.80c.
Polished staples	2.50c.
Galvanized staples	2.75c.
Barbed wire, galvanized	2.60c.
Woven wire fence No. 9 gage, per net ton	$55.00
Woven wire fence, No. 12½ gage and lighter, per net ton	60.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

STEEL PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	47	21½	¼ and ⅜	+9	+34
¼ to ⅜	53	27½	½	25	7
½	58	44½	¾	30	13
¾	62	50½	1 and 1¼	33	17
1 to 3	64	52½	1½ and 2	37	20

Lap Weld

2	57	45½	2	25	11
2½ to 6	61	49½	2½ to 3½	30	15
7 and 8	58	45½	4 to 6	32	19
9 and 10	56	43½	7 and 8	31	18
11 and 12	55	42½	9 to 12	28	13

Butt Weld, extra strong, plain ends

¼	43	26½	¼ and ⅜	+11	+46
½ to ⅜	49	32½	½	25	9
½	55	44½	¾	30	14
¾	60	49½	1 to 2	36	20
1 to 1½	62	51½			
2 to 3	63	52½			

Lap Weld, extra strong, plain ends

2	55	44½	2	31	15
2½ to 4	59	48½	2½ to 4	36	22
4½ to 6	58	47½	4½ to 6	35	21
7 to 8	54	41½	7 and 8	33	19
9 and 10	47	34½	9 to 12	23	10
11 and 12	46	33½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discounts of 5 and 2½%, and on galvanized by 1½ points with supplementary discounts of 5 and 2½%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold-Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3½ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carloads lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. in lighter than standard gages takes the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 40% base	50

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

RAILS AND TRACK SUPPLIES

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	32.00
Light (from rail steel), f.o.b. mill	$28.00 to 30.00

Track Equipment

	Base per 100 Lb.
Spikes, 9/16-in. and larger	$2.60
Spikes, ½-in. and larger	2.60
Spikes, boat and barge	2.80
Tie plate, steel	1.85
Angle bars	2.75
Track bolts, to steam railroads	3.50
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
† Machine bolts	75
† Carriage bolts	75
Lag bolts	75
Plow bolts, Nos. 1, 2, 3 and 7 heads	75
Hot-pressed nuts, blank or tapped, square	75
Hot-pressed nuts, blank or tapped, hexagons	75
C.p.c. and t. square or hex. nuts, blank or tapped	75
Washers*	7.00c. to 6.75c. per lb. off list

* F.o.b. Chicago, New York and Pittsburgh.
† Bolts with rolled thread up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	75
Semi-finished hexagon castellated nuts, S.A.E.	75
Stove bolts in packages, P'gh, 77½, 25 and 10	
Stove bolts in packages, Ch'go, 77½, 25 and 10	
Stove bolts in pkgs., Cleveland, 77½, 25 and 10	
Stove bolts in bulk, P'gh	80
Stove bolts in bulk, Chicago	80
Stove bolts in bulk, Cleveland	80
Tire bolts	60 and 10

Discount of 75 per cent off on bolts and nuts applies on carload business with jobbers and large consumers.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.25
F.o.b. Chicago	70, 10 and 5

Small Rivets

(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread, 75 and 10	
Upset hex. head cap screws, U.S.S.S. or S.A.E. thread, 85 and 10 to 85, 10, 10 and 10	
Upset set screws	80, 10 and 5
Milled studs	70

SEMI-FINISHED STEEL

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10 in., Pittsburgh	$26.00 to $28.00
Rerolling, 4-in. and under 10-in., Youngstown	26.00 to 28.00
Rerolling, 4-in. and under 10 in., Cleveland	26.00 to 28.00
Rerolling, 4-in. and under 10-in., Chicago	29.00
Forging quality, Pittsburgh	33.00 to 34.00
Forging quality, Youngstown	33.00

Sheet Bars

(Open-Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$26.00 to $28.00
Youngstown	26.00 to 28.00
Cleveland	26.00 to 28.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$26.00 to $28.00
Youngstown	26.00 to 28.00
Cleveland	26.00 to 28.00

(Turn to next page)

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.60c.
Universal	1.60c.
Sheared	1.60c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$37.00
Cleveland	37.00
Chicago	38.00

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.00 to $2.25
Foundry, f.o.b. Connellsville prompt	3.00 to 4.25
Foundry, by-product, Chicago ovens	7.00
Foundry, by-product, New England, delivered	10.00
Foundry, by-product, Newark or Jersey City, del'd	8.35 to 8.75
Foundry, by-product, Phila.	9.00
Foundry, by product, Cleveland, delivered	7.82
Foundry, Birmingham	5.00
Foundry, by-products, St. Louis, f.o.b., ovens	8.00
Foundry, by-products, del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.40 to $1.50
Mine run coking, coal, f.o.b. W. Pa.	1.50 to 1.60
Gas coal, ¾ in., f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	0.50 to 0.65
Gas slack, f.o.b. W. Pa. mines	0.50 to 0.65

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	4.60c.
No. 4 industrial	3.50c.
Per Gal. f.o.b. Baltimore	
No. 3 distillate	3.50c.
No. 4 industrial	3.25c.
Per Gal. del'd Chicago	
No. 3 industrial fuel oil	2.65c.
No. 5 industrial fuel oil	2.45c
Per Gal. f.o.b. Cleveland	
No. 3 industrial fuel oil	4.62½c.
No. 4 distillate	3.87½c.

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High heat Duty Brick	Intermediate Duty Brick
Penn.	$35.00	$25.00 to $30.00
Maryland	35.00	25.00 to 30.00
New Jer.	$44.00 to 57.00	
Ohio	35.00	25.00 to 30.00
Kentucky	35.00	25.00 to 30.00
Missouri	35.00	30.00
Illinois	35.00	25.00 to 30.00
Ground fire clay, per ton	6.50	

Chrome Brick

	Per Net Ton
Standard size	$42.50

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$38.00
Chicago	47.00
Birmingham	50.00
Silica clay, per ton	8.0

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$61.50
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	38.50
Domestic, f.o.b. Chewelah, Wash.	20.90

CAST IRON PIPE

Per Net Ton

6-in. and larger, del'd Chicago	$36.40 to $38.40
4-in., del'd Chicago	39.40 to 41.40
6-in. and larger, del'd New York	28.20
4-in., del'd New York	31.20
6-in. and larger, Birm'ham	$32.00 to 33.00
4-in., Birmingham	35.00 to 36.00

Class "A" and gas pipe, $3 extra.

Pig Iron, Ores, Ferroalloys

VALLEY

Per gross ton, f.o.b. Valley furnace:

Basic	$14.00
Bessemer	15.00
Gray forge	14.50
No. 2 foundry	14.50
No. 3 foundry	14.00
Malleable	15.00
Low phos., copper free	25.00

Freight rate to Pittsburgh or Cleveland district, $1.89.

PITTSBURGH

Per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$14.50
No. 2 foundry	15.50
No. 3 foundry	15.00
Malleable	15.50
Bessemer	15.50

Freight rates to points in Pittsburgh district range from 69c. to $1.26.

CHICAGO

Per gross ton at Chicago furnace:

N'th'n No. 2 fdy.	$16.00
N'th'n No. 1 fdy.	16.50
Malleable, not over 2.25 sil.	16.00
High phosphorus	16.00
Lake Super. charcoal, sil. 1.50, by rail	23.17
Southern No. 2 fdy.	16.14
Low phos., sil. 1 to 2, copper free	27.50
Silvery, sil. 8 per cent.	23.67
Bess. ferrosil'n, 15 per cent	28.92

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnaces, not including a switching charge.

ST. LOUIS

Per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$17.50
Malleable, f.o.b. Granite City	17.50
Northern No. 2 fdy., del'd St. Louis	$18.30 to 18.80
Southern No. 2 fdy. del'd.	14.56
Northern malleable, del'd.	18.30 to 18.80
Northern basic, deliv'd	18.30 to 18.80

Freight rates 83c. (average) Granite City to St. Louis; $2.30 from Chicago; $4.56 from Birmingham.

NEW YORK

Per gross ton, delivered New York district:

*Buffalo, No. 2, del'd east. N. J.	$17.41 to $17.66
East. Pa. No. 2 fdy.	15.52
East. Pa. No. 2X fdy.	16.02

Freight rates: $1.52 to $2.63 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.41 a ton from Buffalo.

BUFFALO

Per gross ton, f.o.b. furnace:

No. 2 fdy.	$16.00
No. 2X fdy.	16.50
No. 1 fdy.	17.50
Malleable, sil. up to 2.25	16.50
Basic	15.50
Lake Superior charcoal, del'd	23.41

NEW ENGLAND

Per gross ton delivered to most New England points:

*Buffalo, sil. 1.75 to 2.25	$19.54 to $20.04
*Buffalo, sil. 2.25 to 2.75	$19.54 to $20.04
*Ala., sil. 1.75 to 2.25	19.74
*Ala., sil. 2.25 to 2.75	20.24
†Ala., sil. 1.75 to 2.25	15.88
†Ala., sil. 2.25 to 2.75	16.28

Freight rates: $5.04 all rail from Buffalo; $3.75 all rail from Alabama and $5.88 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

CINCINNATI

Per gross ton, delivered Cincinnati:

Ala. fdy., sil. 1.75 to 2.25	$13.82
Ala. fdy., sil. 2.25 to 2.75	14.32
Tenn. fdy., sil. 1.75 to 2.25	13.82
N'th'n No. 2 foundry	$17.01 to 17.59
S'th'n Ohio silvery, 8%	21.02

Freight rates, $2.02 from Ironton and Jackson, Ohio; $3.82 from Birmingham.

PHILADELPHIA

Per gross ton at Philadelphia:

East. Pa. No. 2	$14.81
East. Pa. No. 2X	15.34
East. Pa. No. 1X	15.81
Basic (del'd east. Pa.)	16.00
Malleable	$18.00 to 18.50
Stand. low phos. (f.o.b. east. Pa. furnace)	22.00 to 23.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 22.50
Va. No. 2 plain	22.04
Va. No. 2X	22.54

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 84c. to $1.79 from eastern Pennsylvania furnaces; $4.67 from Virginia furnaces.

CLEVELAND

Per gross ton at Cleveland furnace:

N'th'n No. 2 fdy. (local delivery)	$15.50
S'th'n fdy., sil. 1.75 to 2.25	16.14
Malleable (local delivery)	15.50
Ohio silvery, 8 per cent	21.87
Stand. low. phos., Valley	25.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 55c. average local switching charge; $3.12 from Jackson, Ohio; $6.14 from Birmingham.

BIRMINGHAM

Per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$11.00
No. 2 soft, 2.25 to 2.75 sil.	11.50
Basic	11.00

CANADA

Per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	$23.00 to 23.50

Ferromanganese

Per Gross Ton

Domestic, 80%, seaboard	$68.00
Foreign, 80%, Atlantic or Gulf port, duty paid	68.00

Prices for lots of one carload or more; extras applied on less than carload lots.

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$26.00 to $27.00

Electric Ferrosilicon

Per Gross Ton Delivered

50% (carloads)	$77.50
50% (less carloads)	85.00
75% (carloads)	126.00
75% (less carloads)	136.00
14% to 16% (f.o.b. Welland, Ont., in carloads)	31.00
14% to 16% (less carloads)	36.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
10%	$20.50	14%	$23.50
11%	21.00	15%	24.00
12%	21.50	16%	25.00
13%	22.50	17%	26.50

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
6%	$18.00	12%	$20.50
7%	18.50	13%	21.50
8%	18.75	14%	22.50
9%	19.00	15%	23.00
10%	19.50	16%	24.00
11%	20.00	17%	25.50

Other Ferroalloys

Ferrotungsten, per lb. wo. del., carloads	$1.08
Ferrotungsten, less carloads	$1.15 to 1.25
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	10.00c
Ferrochromium, 2% carbon	17.00c. to 17.50c.
Ferrochromium, 1% carbon	19.00c. to 20.00c.
Ferrochromium, 0.10% carbon	23.50c. to 25.00c.
Ferrochromium, 0.06% carbon	25.50c. to 27.00c.
Ferrovanadium, del., per lb. contained Va.	$3.05 to $3.30
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	160.00
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base per gross ton	68.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton	$91.00
Silico spiegel, per ton, f.o.b. furnace, car lots	42.50
Ton lots or less, per ton	47.50
Silico-manganese, gross ton, delivered: 2.50% carbon grade	105.00
1% carbon grade	115.00
Spot prices	$5 a ton higher

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian	8c. to 8.50c.
Iron, low phos., Swedish, average 68½ iron	9.00c.
Iron, basic or foundry, Swedish, average 65% iron	8.00c.
Iron, basic and foundry, Russian, aver. 63% iron (nom.)	9.00c.
Manganese, Caucasian, washed 52%	24.00c.
Manganese, African, Indian, 50-52%	23c. to 24c.
Manganese, Brazilian, 46 to 48%	21c. to 22c.

	Per Gross Ton
Tungsten, Chinese wolframite	$10.75 to $11.00
Tungsten, domestic scheelite	$10.00 to 10.50
Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic seaboard	18.00
Chrome, 48%, Cr_2O_3, c.i.f. Atlantic seaboard	30.00

Fluorspar

	Per Net Ton
Domestic, washed gravel, 85-5, Kentucky and Illinois mines, freight allowed, Pittsburgh basis	$20.91
No. 2 lump, 85-5, Kentucky and Illinois mines, freight allowed, Pittsburgh basis	22.31
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	$17.00 to 17.40
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	32.00

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$8.75 to	$9.25
No. 2 heavy melting steel	7.00 to	7.50
No. 2 railroad wrought	8.75 to	9.25
Scrap rails	8.75 to	9.25
Rails 3 ft. and under	10.50 to	11.00
Sheet bar crops, ordinary	9.00 to	9.50
Compressed sheet steel	8.50 to	9.00
Hand bundled sheet steel	7.25 to	7.75
Hvy. steel axle turnings	7.25 to	7.75
Machine shop turnings	5.25 to	5.75
Short shov. steel turnings	5.50 to	6.00
Short mixed borings and turnings	5.50 to	6.00
Cast iron borings	5.50 to	6.00
Cast iron carwheels	8.50 to	9.00
Heavy breakable cast	7.75 to	8.25
No. 1 cast	8.50 to	9.50
Railr. knuckles and couplers	9.00 to	9.50
Rail. coil and leaf springs	9.00 to	9.50
Rolled steel wheels	9.00 to	9.50
Low phos. billet crops	11.00 to	11.50
Low phos. sheet bar crops	10.50 to	11.00
Low phos. plate scrap	9.50 to	10.00
Low phos. punchings	9.50 to	10.00
Steel car axles	11.50 to	12.00

CHICAGO

Delivered Chicago district consumers:

Per Gross Ton		
Heavy melting steel	$5.50 to	$6.00
Shoveling steel	5.50 to	6.00
Frogs, switches and guards	5.50 to	6.00
Hydraulic comp. sheets	4.25 to	4.75
Drop forge flashings	3.75 to	4.25
No. 1 busheling	4.00 to	4.50
Rolled carwheels	6.50 to	7.00
Railroad tires	7.50 to	8.00
Railroad leaf springs	7.50 to	8.00
Axle turnings	4.00 to	4.50
Steel couplers and knuckles	5.50 to	6.00
Coil springs	7.50 to	8.00
Axle turnings (elec.fur.)	4.50 to	5.00
Low phos. punchings	7.00 to	7.50
Low phos. plates, 12 in. and under	6.50 to	7.00
Cast iron borings	3.25 to	3.75
Short shoveling turnings	3.25 to	3.75
Machine shop turnings	2.75 to	3.25
Rerolling rails	7.75 to	8.25
Steel rails, less than 3 ft.	7.50 to	8.00
Steel rails, less than 2 ft.	8.00 to	8.50
Angle bars, steel	6.50 to	7.00
Cast iron carwheels	5.50 to	6.00
Railroad malleable	5.25 to	5.75
Agricultural malleable	5.25 to	5.75
*Relaying rails, 56 to 60 lb.	15.00 to	17.00
*Relay rails, 65 lb. and up	18.00 to	23.00

Per Net ton

Iron angle and splice bars	$5.25 to	$5.75
Iron arch bars, transoms	4.50 to	5.00
Iron car axles	10.50 to	11.00
Steel car axles	8.25 to	8.75
No. 1 railroad wrought	3.75 to	4.25
No. 2 railroad wrought	4.75 to	5.25
No. 1 busheling	3.50 to	4.00

No. 2 busheling	$2.00 to	$2.50
Locomotive tires, smooth	7.50 to	8.50
Pipes and flues	2.50 to	3.00
No. 1 machinery cast	6.00 to	6.50
Clean automobile cast	6.25 to	6.75
No. 1 railroad cast	5.25 to	5.75
No. 1 agricultural cast	5.00 to	5.50
Stove plate	5.25 to	5.75
Grate bars	5.00 to	5.50
Brake shoes	5.50 to	6.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$6.00 to	$6.50
No. 2 heavy melting steel	4.50 to	5.00
No. 1 railroad wrought	7.00 to	7.50
Bundled sheets	4.50 to	5.00
Hydraulic compressed, new	5.00 to	5.50
Hydraulic compressed, old	4.00 to	4.50
Machine shop turnings	3.00 to	3.50
Heavy axle turnings	5.50 to	6.00
Cast borings (nom.)	3.00 to	3.50
Heavy breakable cast	7.50 to	8.00
Stove plate (steel works)	6.00 to	6.50
No. 1 low phos. heavy	9.50 to	10.00
Couplers and knuckles	7.00 to	7.50
Rolled steel wheels	7.00 to	7.50
No. 1 blast furnace (nom.)	3.00 to	3.50
Spec. iron and steel pipe	5.50 to	6.00
Shafting	10.00 to	11.00
Steel axles	13.50 to	14.00
No. 1 forge fire	5.50 to	6.00
Cast iron carwheels	8.00 to	8.50
No. 1 cast	8.00 to	8.50
Cast borings (chem.)	8.00 to	10.50
Steel rails for rolling	9.00 to	9.50

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$6.25 to	$6.75
No. 2 heavy melting steel	6.00 to	6.25
Compressed sheet steel	6.25 to	6.75
Light bundled sheet stampings	5.25 to	5.50
Drop forge flashings		5.00
Machine-shop turnings	3.25 to	3.50
Short shoveling turnings	5.00 to	5.25
No. 1 busheling	5.00 to	5.50
Steel axle turnings	5.00 to	5.50
Low phos., billet crops	9.00 to	10.00
Cast iron borings	3.50 to	4.00
Mixed borings and short turnings	3.50 to	4.00
No. 2 busheling	3.50 to	4.00
No. 1 cast	6.50 to	7.00
Railroad grate bars	6.00 to	6.50
Stove plate	6.00 to	6.50
Rails under 3 ft	10.00 to	10.50
Rails for rolling	9.00 to	9.50
Railroad malleable	7.50 to	8.00
Cast iron carwheels	7.50 to	8.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	$6.50 to	$7.00
No. 2 heavy melting scrap		5.00
Scrap rails	6.75 to	7.25
New hydraul. comp. sheets		5.00
Old hydraul. comp. sheets		4.00
Drop forge flashings		5.00
No. 1 busheling		5.00
Hvy. steel axle turnings		6.50
Machine shop turnings	4.00 to	4.50
Knuckles and couplers		10.00
Coil and leaf springs		10.00
Rolled steel wheels		10.00
Low phos. billet crops	10.00 to	10.50
Short shov. steel turnings	6.00 to	6.50
Short mixed borings and turnings		5.00
Cast iron borings		5.00
No. 2 busheling	3.50 to	4.00
Steel car axles	10.00 to	11.00
Iron axles	10.00 to	11.00
No. 1 machinery cast	9.00 to	9.50
No. 1 cupola cast	8.25 to	8.75
Stove plate	7.25 to	7.50
Steel rails, 3 ft. and under	9.50 to	10.00
Cast iron carwheels	8.00 to	9.00
Industrial malleable	8.00 to	8.50
Railroad malleable	8.00 to	8.50
Chemical borings	7.50 to	8.00

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	$7.00 to	$7.50
Scrap steel rails	7.50 to	8.00
Short shoveling turnings		4.00
Stove plate		6.00
Steel axles		9.00
Iron axles		9.00
No. 1 railroad wrought	4.50 to	5.00
Rails for rolling	8.00 to	8.50
No. 1 cast		8.00
Tramcar wheels		8.00
Cast iron borings, chem.		8.50

ST. LOUIS

Dealers' buying prices per gross ton:

Selected heavy steel	$5.50 to	$6.00
No. 1 heavy melting	5.25 to	5.75
No. 2 heavy melting	4.50 to	5.00
No. 1 locomotive tires	4.75 to	5.25
Misc. stand-sec. rails	6.00 to	6.50
Railroad springs	7.50 to	8.00
Bundled sheets	3.75 to	4.25
No. 2 railroad wrought	5.25 to	5.75
No. 1 busheling	4.25 to	4.75
Cast iron borings and shoveling turnings	4.00 to	4.50
Iron rails	7.00 to	7.50
Rails for rolling	7.50 to	8.00
Machine shop turnings	2.50 to	3.00
Heavy turnings	4.50 to	5.00
Steel car axles	9.00 to	9.50
Iron car axles	12.50 to	13.00
Wrot. iron bars and trans.	5.00 to	5.50
No. 1 railroad wrought	4.00 to	4.50
Steel rails less than 3 ft.	8.50 to	9.00
Steel angle bars	6.00 to	6.50
Cast iron carwheels	5.00 to	5.50
No. 1 machinery cast	7.00 to	7.50
Railroad malleable	4.75 to	5.25
No. 1 railroad cast	6.25 to	6.75
Stove plate	5.50 to	6.00
Relay, rails, 60 lb. and under	16.00 to	16.50
Relay, rails, 70 lb. and over	20.00 to	21.00
Agricult. malleable	5.00 to	5.50

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$4.00 to	$4.50
No. 2 heavy melting steel	2.00 to	2.25
Heavy melting steel (yard)	1.50 to	2.00
No. 1 hvy. breakable cast	4.50 to	4.75
Stove plate (steel works)	2.25 to	2.75
Machine shop turnings	0.50 to	1.00
Short shoveling turnings	0.50 to	1.00
Cast borings	0.50 to	1.00
No. 1 blast furnace	0.50 to	1.00
Steel car axles	9.75 to	10.00
Iron car axles (nom.)	14.00 to	14.50
Spec. iron and steel pipe	2.00 to	2.50
Forge fire		3.25
No. 1 railroad wrought	4.00 to	4.50
No. 1 yard wrought, long	3.25 to	3.50
Rails for rolling	5.00 to	5.50
No. 1 cast	5.00 to	5.25
No. 2 cast	4.00 to	4.50
Stove plate (foundry)		3.25
Malleable cast (railroad)	4.50 to	5.00
Cast borings (chemical)	6.00 to	6.50

Per gross ton, delivered local foundries:

No. 1 machinery cast		$8.00
No. 1 hvy. cast (cupola size)		7.50
No. 2 cast		6.50

BOSTON

Dealers' buying prices per gross ton:

No. 1 heavy melting steel		$3.35
Scrap T rails		3.35
Machine shop turnings	0.80 to	1.00
Cast iron borings		1.05
Bundled skeleton, long	2.00 to	2.10
Forge flashings	3.00 to	3.50
Blast furnace scrap	0.90 to	1.00
Forge scrap	3.00 to	3.25
Shafting	9.50 to	10.00
Steel car axles	9.00 to	9.50
Wrought pipe	4.00 to	4.25
Rails for rolling	6.00 to	6.50
Cast iron borings, chemical	7.00 to	7.25

Per gross ton delivered consumers' yards:

Textile cast	$7.00 to	$7.50
No. 1 machinery cast	7.50 to	8.00
Stove plate	5.00 to	5.25
Railroad malleable	10.50 to	11.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$4.50 to	$5.00
Scrap rails for melting	6.00 to	6.50
Loose sheet clippings	1.00 to	1.50
Bundled sheets	4.25 to	4.75
Cast iron borings	2.75 to	3.25
Machine shop turnings	2.75 to	3.25
No. 1 busheling	3.75 to	4.25
No. 2 busheling	2.00 to	2.50
Rails for rolling	6.50 to	7.00
No. 1 locomotive tires	7.00 to	7.50
Short rails	8.00 to	8.50
Cast iron carwheels	6.50 to	7.00
No. 1 machinery cast	8.50 to	9.00
No. 1 railroad cast	7.50 to	8.00
Burnt cast	3.25 to	3.75
Stove plate	3.25 to	3.75
Agricultural malleable	7.00 to	7.50
Railroad malleable	7.50 to	8.00

DETROIT

Dealers' buying prices per gross ton:

Hvy. melting steel	$4.50 to	5.00
Borings and short turnings	1.75 to	2.25
Long turnings	1.50 to	2.00
No. 1 machinery cast	7.50 to	8.00
Automotive cast	9.75 to	10.25
Hydraul comp. sheets	4.00 to	4.50
Stove plate	3.50 to	4.00
New No. 1 bundeling	3.50 to	4.00
Old No. 2 busheling	1.25 to	1.75
Sheet clippings	1.75 to	2.25
Flashings	3.25 to	3.75

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	7.00	$6.00
Rails, scrap	7.00	6.00
No. 1 wrought	6.00	8.00
Machine shop turnings	2.00	2.00
Boiler plate	5.00	4.50
Heavy axle turnings	2.50	2.50
Cast borings	2.00	2.00
Steel borings	2.00	2.00
Wrought pipe	2.00	2.00
Steel axles	7.00	9.00
Axles, wrought iron	7.00	11.00
No. 1 machinery cast	12.50	10.00
Stove plate	10.00	8.00
Standard carwheels	1.00	8.50
Malleable	10.00	8.00

Warehouse Prices for Steel Products

PITTSBURGH

	Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.60c.
Reinforcing steel bars	2.60c.
Cold-finished and screw stock—	
Rounds and hexagons	2.95c.
Squares and flats	3.45c.
Bands	2.95c.
Hoops	3.60c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.15c.
Galv. sheets (No. 24), 25 or more bundles	3.65c.
Hot-rolled sheets (No. 10)	3.10c.
Galv. corrug. sheets (No. 28), per square (less than 3750 lb.)	$3.74
Spikes, large	2.50c.
Small	2.75c. to 2.90c.
Boat	3.00c.
Track bolts, all sizes, per 100 count, 70 and 10 per cent off list	
Machine bolts, 100 count, 70 and 10 per cent off list	
Carriage bolts, 100 count, 70 and 10 per cent off list	
Nuts, all styles, 100 count 73 and 10 per cent off list	
Large rivets, base per 100 lb	$3.00
Wire, black, soft ann'l'd, base per 100 lb	2.75
Wire, galv. soft, base per 100 lb	3.20
Common wire nails, per keg	2.35
Cement coated nails, per keg	2.35

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	2.75c.
Reinforcing bars, billet steel	1.65c. to 1.75c.
Rail steel reinforcement	1.45c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	2.95c.
Flats and squares	3.45c.
Bands, $\frac{1}{4}$ in. (in Nos. 10 and 12 gages)	2.95c.
Hoops (No. 14 gage and lighter)	3.50c.
Hot-rolled annealed sheets (No. 22)	3.55c.
Galv. sheets (No. 24)	4.10c.
Hot-rolled sheets (No. 10)	3.20c.
Spikes ($\frac{1}{2}$ in. and lighter)	3.45c.
Track bolts	4.30c.
Rivets, structural	3.75c.
Rivets, boiler	3.75c.

	Per Cent Off List
Machine bolts	70
Carriage bolts	70
Coach and lag screws	70
Hot-pressed nuts, sq., tap, or blank	70
Hot-pressed nuts, hex., tap, or blank	70
No. 8 black ann'l'd wire, per 100 lb	$3.45
Com. wire nails, base per keg	2.30
Cement c't'd nails, base per keg	2.30

NEW YORK

	Base per Lb.
Plates and struc. shapes	2.70c. to 3.10c.
Soft steel bars, small shapes	2.70c. to 3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	6.00c. to 6.50c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.52c.
Flats and squares	4.02c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Hot-rolled sheets (No. 10)	3.00c. to 3.25c.
Hot-rolled ann'l'd sheets (No. 24*)	3.50c.
Galvanized sheets (No. 24*)	4.00c.
Long terne sheets (No. 24)	4.50c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.60c.
Wire, galv. annealed (No. 10)	4.05c.
Tire steel, $\frac{1}{2}$ x $\frac{1}{8}$ in. and larger	3.40c.
Smooth finish, 1 to 2$\frac{1}{2}$ x $\frac{1}{4}$ in. and larger	3.75c.
Open-hearth spring steel, bases	4.50c. to 7.00c.
Common wire nails, base, per keg	$2.60

	Per Cent
Machine bolts, cut thread:	Off List
$\frac{3}{4}$ x 6 in. and smaller	65 to 65 and 10
1 x 30 in. and smaller	65 to 65 and 10
Carriage bolts, cut thread:	
$\frac{1}{2}$ x 6 in. and smaller	65 to 65 and 10
$\frac{3}{4}$ x 30 in. and smaller	65 to 65 and 10

	Per 100 Ft.
Boiler Tubes:	
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
Cold-fin. rounds, shafting, screw stock	3.31c.
Hot-rolled annealed sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.35c.
Hot-rolled sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	3.85c.
Galv. corrug. sheets	4.40c.
Structural rivets	4.00c.
Boiler rivets	4.00c.

	Per Cent Off List
Tank rivets, $\frac{7}{8}$ in. and smaller, 100 lb. or more	65
Less than 100 lb	60
Machine bolts	70
Carriage bolts	70
Lag screws	70
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	70
Less than 200 lb	60
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	70
Less than 200 lb	60

PHILADELPHIA

	Base per Lb.
Plates, $\frac{1}{4}$-in. and heavier	2.45c.
Structural shapes	2.45c.
Soft steel bars, small shapes, iron bars (except bands)	2.45c.
Reinforc. steel bars, sq., twisted and deform.	2.30c.
Cold-fin. steel, rounds and hex.	3.50c.
Cold-fin. steel, sq. and flats	4.00c.
Steel hoops	3.00c.
Steel bands, No. 12 to 3/16-in., incl.	2.75c.
Spring steel	5.00c.
Hot-rolled annealed sheets (No. 24)	3.55c.
Galvanized sheets (No. 24)	3.75c.
Hot-rolled and annealed sheets (No. 10)	3.05c.
Diam. pat. floor plates, $\frac{1}{4}$ in.	5.00c.
Swedish iron bars	5.60c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

CLEVELAND

	Base per Lb.
Plates and struc. shapes	2.95c.
Soft steel bars	2.75c.
Reinforc. steel bars	1.75c. to 1.95c.
Cold-fin. rounds and hex.	2.95c.
Cold-fin. flats and sq.	3.45c.
Hoops and bands, No. 12 to $\frac{1}{8}$ in., inclusive	3.00c.
Hoops and bands, No. 13 and lighter	3.55c.
Cold-finished strip	*5.55c.
Hot-rolled annealed sheets (No. 24)	3.25c.
Galvanized sheets (No. 24)	3.75c.
Hot-rolled sheets (No. 10)	3.00c.
Black ann'l'd wire, per 100 lb	$2.75
No. 9 galv. wire, per 100 lb	3.20
Com. wire nails, base per keg	2.35

*Net base, including boxing and cutting to length.

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
New billet reinfore. bars	3.00c.
Rails steel reinfore. bars	3.00c.
Hoops	3.90c.
Bands	3.20c.
Cold-fin. rounds and hex.	3.29c.
Squares	3.75c.
Hot-rolled annealed sheets (No. 24)	3.75c.
Galv. sheets (No. 24)	4.25c.
Hot rolled sheets (No. 10)	3.30c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb	$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.65
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg	2.95
Chain, per 100 lb	10.25

	Net per 100 Ft.
Seamless steel boiler tubes, 2-in.	$17.50
4-in.	36.00
Lap-welded steel boiler tubes, 2-in.	16.50
4-in.	34.50

BUFFALO

	Base per Lb.
Plates and struc. shapes	3.25c.
Soft steel bars	3.00c.
Reinforcing bars	2.65c.
Cold-fin. flats and sq.	3.65c.
Rounds and hex.	3.15c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.10c.
Bands	3.35c.
Hoops	3.90c.
Hot-rolled sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$2.45
Black wire, base per 100 lb.	3.20

BOSTON

	Base per Lb.
Plates	*3.35c.
Structural shapes	*3.35c.
Soft steel bars, small shapes	*3.25c.
Reinforcing bars	3.10c. to 3.25c.
Iron bars—	
Refined	3.25c.
Best refined	4.60c.
Spring steel, open-hearth	5.00c.
Tire steel	4.50c. to 4.75c.
Bands	*3.75c. to 4.25c.
Hoop steel	4.90c. to 5.40c.
Cold-rolled steel—	
Rounds and hex.	3.50c. to 5.50c.
Squares and flats	4.00c. to 6.00c.
Rivets, structural or boiler	4.80c.

	Per Cent Off List
Machine bolts	70
Carriage bolts	70
Lag screws	70
Hot-pressed nuts	40 and 10
Cold-punched nuts	40 and 10
Stove bolts	70 and 10

*Base price (250 to 999 lb.); less than 250 lb., add 50c. per 100 lb.; 1000 to 7999 lb., deduct 15c.; 8000 to 14,999 lb., deduct 25c.; 15,000 lb. and larger lots, deduct 35c.

PACIFIC COAST

	Base Per Lb. San Francisco	Los Angeles	Seattle
Plates and struc. shapes, $\frac{1}{4}$-in. and heavier	3.25c.	3.50c.	3.00c.
Soft steel bars	3.25c.	3.50c.	3.00c.
Reinforcing bars	3.00c.	3.00c.	3.00c.
Hot-rolled annealed sheets (No. 24)	3.95c.	4.20c.	4.50c.
Hot-rolled sheets (No. 10)	3.50c.	3.50c.	4.00c.
Galv. sheets (No. 24)	4.55c.	4.50c.	5.00c.
Struc. rivets, $\frac{1}{2}$ in. and larger, less than 1000 lb.	5.00c.	5.00c.	4.00c.
Cold-finished steel			
Rounds	5.50c.	5.50c.	4.50c.
Squares and hexagons	6.75c.	6.75c.	5.75c.
Flats	7.25c.	7.25c.	6.75c.
Common wire nails, base per keg in less carloads	$2.75	$2.75	$2.85

Plates, shapes, bars, bands and hot-rolled sheets, No. 16 gage and heavier, subject to reductions for quantity. Cold-finished quotations based on 100 lb. minimum quantity.

Fabricated Structural Steel

New Projects Gain—Awards in Smaller Volume

WITH the bulk of awards in small tonnages, total bookings of fabricated steel the past week call for 17,300 tons, compared with 43,200 tons in the previous week. Requirements for the Hoover Dam account for 4700 tons. New inquiries of 16,500 tons compare with 15,300 tons a week ago. Bridges in various sections of the country will require more than 14,000 tons, including 6700 tons for the State of Michigan. Awards follow:

NORTH ATLANTIC STATES

Somerset County, Vt., 130 tons, bridge, to Lackawanna Steel Construction Corpn.

State of Maine, 140 tons, bridge, to Lackawanna Steel Construction Corpn.

Roxbury, Mass., 230 tons, health unit, to New England Structural Co.

Brookline, Mass., 225 tons, telephone exchange building, to New England Structural Co.

New York, 385 tons, garage, St. Ann's Avenue and 132nd Street, to George A. Just Co.

New York, 260 tons, four-story building, 411 East 106th Street, to Harris Structural Steel Co.

New York, 170 tons, Mercantile Library, East Forty-seventh Street, to Montgomery Iron & Steel Co.

New York, 220 tons, alteration to building for New York Steam Corpn., to American Bridge Co.

Brooklyn, 255 tons, addition to Bedford branch, Y.M.C.A., to George A. Just Co.

Jamestown, N. Y., 200 tons, State Armory, to Lackawanna Steel Construction Corpn.

Vernon, N. Y., 100 tons, State bridge, to Lackawanna Steel Construction Corpn.

East Orange, N. J., 250 tons, S. H. Kress store building, to H. R. Goeller Iron Works.

Hoboken, N. J., 400 tons, plant for Hinde & Dauch Paper Co., to Belmont Iron Works.

Philadelphia, 300 tons, restaurant building for Frank G. Shattuck Co., to Morris Wheeler & Co.

South Philadelphia, 225 tons, addition to high school, to Robinson Iron & Steel Co.

SOUTH AND SOUTHWEST

Chattanooga, Tenn., 1100 tons, post office, to Virginia Bridge & Iron Co.

Meridian, Miss., 446 tons, post office, to Virginia Bridge & Iron Co.

Myrtle, Ark., 800 tons, bridge for Missouri Pacific Railway, to Stupp Brothers Bridge & Iron Co.

Miami, Okla., 120 tons, post office, to Des Moines Steel Co.

Custer County, Okla., 140 tons, bridge, to J. B. Klein Iron & Foundry Co.

CENTRAL STATES

Terre Haute, Ind., 800 tons, post office, to Whitehead & Kales Co.

Fort Wayne, Ind., 525 tons, boiler house, to Western Gas Construction Co.

Chicago, 750 tons, General Motors building for Worlds Fair, to Reuter Brothers.

Custer County, S. D., 200 tons, truss spans, to Pittsburgh-Des Moines Steel Co.

Marion County, Mo., 290 tons, highway bridge, to Vincennes Bridge Co.

Camden County, Mo., 190 tons, highway bridge, to Clinton Bridge Co.

Lyon County, Kan., 150 tons, bridge, to Kansas Structural Steel Co.

WESTERN STATES

Hoover Dam, 1200 tons, bulkhead, to Consolidated Steel Corpn.

Hoover Dam, 3500 tons, bulkhead gate material, to Independent Bridge Co., Lakeside Bridge & Steel Co., Hardie-Tynes Mfg. Co. and Reading Iron Works.

Los Angeles, 488 tons, Firestone Avenue bridges, to Kyle Steel Construction Co.

Oakland, Cal., 150 tons, W. T. Grant Co. building, to Judson-Pacific Co.

San Francisco, 1000 tons, distributing plant for Dairy Delivery Co., to McClintic-Marshall Corpn.

State of California, 1050 tons, two highway bridges, to Moore Dry Dock Co.

West Hollywood, Cal., 390 tons, sub-station, to McClintic-Marshall Corpn.

State of Washington, 470 tons, highway bridge, to D. Nygren, Seattle.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Dixfield, Me., 150 tons, warehouse.

South Boston, 110 tons, Economy Co. warehouse.

Brookline, Mass., 100 tons, Deaconness Hospital unit.

State of New York, 675 tons, highway bridges.

Buffalo, 2000 tons, Sisters Hospital.

State of Pennsylvania, 700 tons, highway bridges.

Rochester, Pa., 1400 tons, highway bridge.

Beaver, Pa., 1400 tons; bids to be taken June 17.

SOUTH AND SOUTHWEST

State of Kentucky, 500 tons, highway bridges.

West Point, Ky., 550 tons, bridge for Illinois Central Railroad.

Cotton County, Okla., 141 tons, highway bridge.

State of Oklahoma, 350 tons, bridges.

CENTRAL STATES

State of Illinois, 300 tons, highway bridge at Bigsville.

Algonquin, Ill., 450 tons, highway bridge.

Seneca, Ill., 1200 tons, bridge; Wisconsin Bridge & Iron Co., low bidder.

State of Wisconsin, 200 tons, State highway bridges in Sauk and Dane counties; bids June 21.

Jefferson City, Mo., 200 tons, post office; A. W. Kutsche & Co., low bidders on general contract.

Shelbyville, Mo., 300 tons, highway bridge.

State of Michigan, 6700 tons, highway bridge.

WESTERN STATES

State of Oregon, 110 tons, highway bridges, bids close June 23.

Redlands, Cal., 113 tons, Orange Street County bridge, bids close June 27.

State of Washington, 230 tons, highway bridges over Pilchuk and Deep rivers.

FABRICATED PLATE AWARDS

Nashville, Tenn., 300 tons, two oil tank barges for Apex Oil Corpn., to Dravo Contracting Co.

Huntington, W. Va., 100 tons, derrick boat for United States Engineers, to Midland Barge Co.

NEW PROJECTS

Pensacola, Fla., 100 tons, unnamed project.

Smith Bluff's, Tex., 400 tons, Pure Oil Co.

Barksdale, La., 100 tons, standpipe for United States Government.

Montreal, 1000 tons, Shell Petroleum Co.

Flushing, N. Y., 140 tons, detention mains and tanks, to Downingtown Iron Works.

Pipe Lines

Cardinal Oil Co. and Phillips Petroleum Co., Bartlesville, Okla., associated, are considering steel pipe line for crude oil from oil fields in Texas to Fort Stockton, Tex. Loading rack will be built at last noted point. Pumping stations will be installed. Cost over $150,000.

Quartermaster, Fort Riley, Kan., asks bids until June 27 for quantity of welded steel pipe (Circular 68).

Iowa-Nebraska Light & Power Co., Lincoln, Neb., is planning a natural gas pipe line from trunk system to Shenandoah, Iowa.

Tri-County Natural Gas Co., 29 East Avenue, Rochester, N. Y., has secured permission for natural gas pipe line system at LeRoy, N. Y., and vicinity.

Central States Electric Co., Cedar Rapids, Iowa, plans installation of natural gas pipe lines in Adair and Union Counties.

Long Beach awarded about 400 tons of ¾- to 8-in. wrought steel gas and line pipe to W. W. Pipe Shop, Long Beach, on low bid of $23,713.20.

Los Angeles, Cal., Metropolitan Water District bond issue of $220,000,000 has been approved and validated and negotiations are in progress with Reconstruction Finance Corpn. at Washington for sale of all or a part of bonds. Department of the Interior and the Public Lands and Rules committees of the House have approved the Swing bill, granting rights of way for proposed aqueduct from Boulder Canyon to Los Angeles.

Cast Iron Pipe

Concord, Mass., has placed 1000 tons of 12- and 16-in. with Warren Foundry & Pipe Corpn.

Boston, Metropolitan Water District has awarded 600 tons of 48-in. to Warren Foundry & Pipe Corpn.

Lynn, Mass., has purchased 150 tons of 8- and 12-in. pipe from United States Pipe & Foundry Co.

Woodstock, N. H., has awarded 100 tons of 6- and 8-in. to Warren Foundry & Pipe Corpn.

West Springfield, Mass., has bought 100 tons of 6-in. and special castings from Donaldson Iron Co.

Beverly, Mass., has placed 100 tons of 12-in. with Warren Foundry & Pipe Corpn.

Waltham, Mass., closed bids on 150 tons, but has made no award as yet.

Bedford Hills, N. Y., State Reformatory for Women has awarded 125 tons of small sizes to United States Pipe & Foundry Co.

Glenham, N. Y., opened bids June 15 on 300 tons of 6- and 8-in.

Beacon, N. Y., and Kingston, N. Y., awarded total of 100 tons of 3 to 16-in. for State projects to Warren Foundry & Pipe Corpn.

Croghan, N. Y., awarded 800 tons of 10-in., 10,000 ft. to Central Foundry Co. and 25,000 ft. to R. D. Wood & Co.

Kingsford, Mich., (mail Iron Mountain), closes bids June 20 on 11,500 lin. ft. of 4- and 6-in. class C.

Milwaukee will soon enter market for a round tonnage of 24- and 36-in.

Oshkosh, Wis., has awarded a miscellaneous tonnage for a pumping plant to Glamorgan Pipe & Foundry Co.

San Rafael, Cal., Army Quartermaster will open bids on June 20 for 600 tons of various sizes for gas and water distributing system for Hamilton Field.

Seattle will call for bids in July on 950 tons of Class D in connection with improvements on Railroad Avenue.

Wrought Iron Welded by Both Plastic and Fusion Processes

(*Concluded from page* 1282)

formly high strength are being obtained in the pipe mill.

In electric resistance, spot and flash welding, put in the general classification of plastic welding, excellent results were said to be obtained with wrought iron, and the inherent characteristics of the metal preserved. Somewhat higher temperatures, obtained by higher current densities, are desired than those for soft steel. The slag inclusions were held to protect the base metal from oxidation at the high heats, and it will not undergo the coarsening of grain structure to the extent experienced with steel. Under proper conditions, a plastic weld, it was said, may attain a strength equal to that of the body metal.

Fusion Welding of Wrought Iron

Although the reputation of wrought iron for high welding quality has been established on the basis of plastic welding, all of the factors which are of value in plastic welding are of merit in the fusion process, said Mr. Aston. Fusion welds of wrought iron may be made with entire satisfaction by any of the customary methods, with only such caution or experience as is necessary with any change of metal types or to take care of fundamental differences in characteristics.

In the application of fusion welding to wrought iron, Mr. Aston advanced the following suggestions: Wrought iron has welding characteristics of high order by reason of high base purity and ferrous silicate slag association. The latter is a valuable aid in protecting the metal surface and in its self-fluxing action; influences of the type sought in coated welding rods. But the first fusion in wrought iron is that of the included slag at a temperature below that of the base metal and too low for the application of the weld metal. Temperatures should be raised somewhat above those of the first greasy or fluxing appearance. Wrought iron can withstand higher heats without damage than other ferrous metals, and, in general, should be worked hotter for best results, he said.

A puddle of molten metal should always be maintained at the point of application of the rod, the end of the rod being kept immersed in the puddle until enough metal has been deposited. Then the edges of the molten puddle and the surrounding colder metal should be fused together to obtain a solid union. The weld progresses by a repetition of this procedure, care being taken to add no metal from the welding rod except through the vehicle of the molten puddle. To obtain sound weld metal free from oxide, which produces low weld strength and porosity, the molten puddle should be disturbed as little as possible.

Quality of welding rod is important. In general, low-carbon iron rods are preferable for most wrought iron welding.

In arc welding of wrought iron, experience indicates that higher heats and, therefore higher current densities, are advisable as compared with similar practices with steel. Indications are that about 10 per cent increase over the values used for soft steel is a fair approximation.

In conclusion it was stated that in major features the welding of wrought iron necessitates no deviation from the technique established for soft steel. Inherently, wrought iron possesses in the highest degree the composition and characteristics fundamental to good welding by either plastic or fusion methods. As a material having some special characteristics, notably that of slag association, there are some details of practice that must be observed or modified, but none are of a type which require extended training for mastery, or which will upset the established order of technique or appliances.

Explains New Theory of Mechanism of Lubrication

A new theory of the mechanism of lubrication was outlined at an informal conference held June 1 at the Engineering Societies Building, New York, under the auspices of the American Society of Mechanical Engineers. This theory, the outcome of the work of the A.S.M.E. lubrication engineering committee, was developed from discoveries made during tests on a machine erected by the Sperry Gyroscope Co., for investigating lubrication phenomena. It was presented in a paper prepared by William F. Parish, consulting lubrication engineer and chairman of the committee, and Leon Cammen, consulting engineer, New York.

Factual support is said to be offered for the discoveries of German investigators to the effect that lubricating properties of oil as such are not determined by the viscosity of the oil. It is also held that the theory offers experimental proof of the correctness of Langmuir's theory under which a layer of lubricant one molecule thick is held by chemical forces at the face of the metal, as well as the theory of French investigators to the effect that a comparatively heavy layer of oil is held to the face of the metal by electrical or magnetic fields.

Not only has the actual presence of these layers been confirmed, but the lubricant has been found to peel off layer after layer, says the report. It has been found further that there is an "ultimate" layer that does not peel off, even when enormous disruptive forces have been applied to it.

Another discovery has been that if the ultimate layer is wiped off the face of the metal a new layer of lubricant is immediately created thereon; in the case of a lubricated steel surface, as many as 21 layers of oil are said to have been wiped off where the presence of even a single fluid layer has never been suspected before.

The picture of the mechanism of lubrication built up from these and other facts was put briefly in the paper as follows: "According to this theory a layer of oil is formed on the surface of the metal, the thickness and strength characteristics of this layer being determined by the character of the lubricant and the character of the metal. This layer, in turn, pumps up under an enormous pressure of oil into the crevices of the metal. In the course of contact with the bearing surfaces on the journal and the brasses (the same applies to ball and roller as well as to Kingsbury bearings), the free film plays no part as a means of separating the surfaces of the metal. This is done by the newly discovered powerful adhering layers of the lubricant and when, in the course of operation of the bearing, these are wiped off, they are immediately restored by the oil ejected under enormous pressure from the crevices in and under the metal surfaces. The remarkable circumstance is therefore established that any lubrication is essentially high pressure lubrication."

In the above mechanism of lubrication entirely new functions are ascribed to the free film of lubricant.

Safety Records Published

National Safety Council, Inc., Chicago, has issued annual reports covering accidental injury rates in the steel and foundry industries in 1931. The best record among large steel organizations, according to the report, was made by Corrigan-McKinney Steel Co., which employs about 1500 men who worked 4,500,000 man-hours with only eight temporary disabilities. Among medium-size steel organizations, the best showing was credited to the South Chicago plant of Youngstown Sheet & Tube Co., which operated throughout the year with only one temporary disability resulting in the loss of 12 days. In the foundry group, the Newcastle, Del., plant of American Manganese Steel Co. operated 240,000 man-hours without a lost-time injury.

PLANT EXPANSION AND EQUIPMENT BUYING

Machine Tool Trade Virtually Stagnant

No Improvement Expected Until Entire Business Situation Has Made a Definite Turn

THE machine tool industry seems resigned to the inescapable conclusion that there will be no improvement in its business until a turn of some importance has occurred in the economic situation. This was the sentiment at the recent meeting of the Associated Machine Tool Dealers, but the distributers are convinced that machine tool markets will make a quick come-back the moment there is an upturn in general business.

Current business has virtually reached a point of stagnation. Some dealers have booked almost no orders this month. The official report of the National Machine Tool Builders' Association probably will show that May orders were below those of April, and a further decline is indicated for June. Some export orders for Russia are giving a few plants a fair amount of work.

NORTH ATLANTIC

Commanding Officer, Watervliet Arsenal, Watervliet, N. Y., asks bids until June 20 for 14 breech ring forgings (Circular 31).

John Morrell & Co., Ottumwa, Iowa, and 620 West Thirty-sixth Street, New York, meat packers, have plans for new two-story packing plant, 75 x 180 ft., at Tenth Street and Kent Avenue, Brooklyn. Cost over $100,000 with equipment. H. Peter Henschien, 59 East Van Buren Street, Chicago, is architect and engineer. Morrell company is carrying out expansion and improvements at main plant at Ottumwa, costing over $300,000 with equipment.

Avigation Instrument Co., Inc., New York, has been organized by Raymond P. Sheehan, 92-31 217th Street, Queens Village, L. I., and John L. Browning, 193 Tillery Street, Brooklyn, to manufacture aeronautical instruments and parts.

Knickerbocker Broadcasting Co., 1697 Broadway, New York, has plans for new radio station with towers, power equipment, etc., coupling building and garage unit at College Point, L. I. Cost over $45,000 with equipment.

Signal Supply Officer, Army Base, Brooklyn, asks bids until June 20 for 30 power units (Circular 163); until June 22 for 200 to 800 jack boxes, 25 to 100 junction boxes, 75 to 250 transmitters, etc. (Circular 168), 100 radio transmitters (Circular 160); until June 24 for horizontal diamond receiving antenna (Circular 169).

Sterling Iron Works, Inc., Bronx, New York, has been organized by Charles and George Baken, 23-03 Twenty-eighth Avenue, Astoria, L. I., to manufacture iron and other metal products. Company will take over and succeed to Sterling Iron & Bronze Works, 1805 Carter Avenue, Bronx.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until June 21 for ventilating sets (Schedule 8192), 1600 butchers' steels, knives, etc. (Schedule 8213) for Brooklyn Navy Yard.

Board of Education, Dobbs Ferry, N. Y., has asked bids on general contract for new multi-story high school and plans manual training department. Cost about $750,000. Knappe & Morris, 171 Madison Avenue, New York, are architects.

Hirde & Dauch Paper Co., Decatur Street, Sandusky, Ohio, manufacturer of corrugated fiber boxes and containers, has plans by Otto Randolph, Inc., 53 W. Jackson Boulevard, Chicago, engineer and contractor, for new plant on site recently acquired at Hoboken, N. J., one story, 180 x 800 ft., and two stories and basement, 80 x 180 ft. Cost over $150,000 with machinery.

American Auto Parts, Inc., 181 Livingston Street, Newark, automobile parts and equipment, leased former plant of Martin-Parry Corpn., manufacturer of automobile bodies at Kearny, N. J., totaling 20,000 sq. ft. floor space and will remodel for new plant.

Smoothcut Can Opener Co., Newark, has been organized by Leo Olschewski, Unionville, N. J., and associates, to manufacture can openers and other specialties, and will be represented by Charles A. Woodruff, 31 Clinton Street, Newark, attorney.

Tite Flex Metal Hose Co., 500 Frelinghuysen Avenue, Newark, has perfected new revolving unit heater and will soon carry out commercial production. Manufacture of metal tubing is being continued on improved schedule, with sales equalling those of a year ago.

Atlantic Oil Producing Co., 260 South Broad Street, Philadelphia, a subsidiary of Atlantic Refining Co., same address has acquired 188 acres of oil properties in Rusk County, east Texas fields, and will develop for production, installing oil drilling machinery and other equipment.

Ornamental Bronze & Iron Works, Inc., Philadelphia, has been organized by Nathan and August Yakatan, 1954 North Hollywood Street, to take over and expand company of same name with plant at 305 North Fifteenth Street.

Commanding Officer, Frankford Arsenal, Philadelphia, asks bids until June 20 for 1,000,000 steel cores for use in bullets (Circular 491), quantity of gages (Circular 498).

Department of Public Works, City Hall Annex, Philadelphia, Frank H. Caven, director, asks bids until June 23 for lamp posts for highways and alleys.

Bethlehem Foundry & Machine Co., Bethlehem, Pa., has closed five year contract with Oil Electric Engineering Corpn., Minneapolis, Minn., for manufacture of all equipment in its line, heretofore produced at last noted plant. Production will soon begin at Bethlehem works with force of about 300 men.

Depot Quartermaster, Marine Corps, Philadelphia, asks bids until June 22 for 204 scabbards (Schedule 956).

Ralph W. Cook, Inc., Philadelphia, has been organized by Ralph W. Cook, 1530 Locust Street, and Richard Dilworth, Chestnut Hill, Pa., capital $100,000, to manufacture motor truck and tractor equipment, engines, parts, etc.

Bell Telephone Co. of Pennsylvania, 1835 Arch Street, Philadelphia, has plans for new multi-story exchange building. Cost over $300,000. John T. Windrim, Commonwealth Building, is architect. Company has authorized additional fund of $369,301, exclusive of amount first noted, for new construction in State, including lines, exchanges, etc.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until June 21 for one steel body and accessories for motor truck chassis (Schedule 8229) for Philadelphia Navy Yard, 39 pneumatic scaling hammers (Schedule 8200) for Philadelphia and Puget Sound yards.

Construction Service, Veterans' Bureau, Washington, asks bids until July 12 for new buildings and utilities at Veterans' institution, Batavia, N. Y., including steel water tank and tower, platform scales, refrigerating and ice-making plant, incinerator plant, water-softening equipment, outside electric distributing system, etc.

Rochester Amphibions, Inc., Rochester, N. Y., has been organized by Andrew J. Townson, Jr., 3350 Elmwood Avenue, and associates, to manufacture airplanes and parts.

SOUTH ATLANTIC

Kelly-Springfield Tire Co., Cumberland, Md., has increased production schedule and is now running on basis of 16 hours a day, seven-day week, with larger working quota.

Purchasing and Contracting Officer, Holabird Quartermaster Depot, Baltimore, asks bids until June 27 for automobile parts, hardware, copper tubing and other equipment (Circular 136).

United States Coast Guard Headquarters, Washington, asks bids until June 21 for quantity of high speed recording equipment (Specification RRS-137).

Fulton County Board of Education, Court House, Atlanta, Ga., plans installation of manual training equipment in three-story high school at North Fulton, for which general contract has been let to Southern Ferro Concrete Co., 70 Ellis Street, N.E., Atlanta. Cost about $175,000. Adler & Shutze, Candler Building, architects.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until June 21 for four motor-driven sensitive drills (Schedule 8184), calipers, dividers, gages, planes and squares (Schedule 8206), machinists' chisels, chisel blanks and pneumatic chisels (Schedule 8171), bits, chisels, knives and scrapers (Schedule 8205), tinners' and sailmakers' shears (Schedule 8202), ratchet braces, breast drills, etc. (Schedule 8199), galvanized steel plates and shapes (Schedule 8227), hand shovels (Schedule 8198), rules and tapes (Schedule 8203), screw drivers (Schedule 8201), clamps and punches (Schedule 8204), motor-generator sets (Schedule 8131) for Eastern and Western yards; tungsten hacksaw blades (Schedule 8172) for New York and Mare Island Navy Yards; electric storage battery truck (Schedule 8252) for Hampton Roads Navy Yard; safety valves and spare parts (Schedule 8183) for Norfolk Navy Yard; until June 28 for 16 motor-driven forced-draft blowers (Schedule 8242) for Philadelphia and Norfolk yards; two storage battery-operated crane trucks (Schedule 8236) for Thorne Navy Yard; about 6800 lb. corrosion-resisting steel hull rivets (Schedule 8238) for New York and San Francisco Navy Yards.

Chief of Engineers, United States Army, Munitions Building, Washington, asks bids until June 21 for two portable pumping sets, gasoline engine-driven (Circular 47).

Shipping Container Corpn., Cape Charles, Va., has work under way on first unit of new plant, 50 x 200 ft., for manufacture of steel containers, and plans early erection of one-story second unit, 50 x 100 ft., for finishing department. W. L. Humes, Salisbury, Md., is architect; Charles F. Russell, vice-president, is company engineer.

Quartermaster, Marine Corps, Washington, asks bids until June 20 for six rivet sets,

THESE TUBES KEEP YOUR BOILER GOING

Smooth, steady operation is profitable operation. Continuous performance at full efficiency is the real measure of success. Whatever helps to maintain it, will reduce costly intervals of "time out" for repairs, and avert the likelihood of schedules being balked or confused.

NATIONAL-SHELBY Seamless Boiler Tubes, for Locomotive, Stationary and Marine Boilers, by their unusual strength, ductility, general durability and high resistance to corrosive attack, not only cut down replacements, but give maximum assurance against interruptions to service—they keep your boiler going. Ask for Bulletin No. 12, discussing the advantages of NATIONAL-SHELBY Seamless Boiler Tubes.

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NATIONAL SEAMLESS

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welding outfits, wrenches, punches, drills, etc. (Circular 943), copper wire, cable grips, wire tools, hand sets, protector blocks, cable terminals, etc. (Circular 945); until June 22 for metal storage bin, steel shelving, metal counter and other metal sections (Schedule 950), steel chute for marine barracks, Quantico, Va., (Schedule 937).

Bureau of Yards and Docks, Navy Department, Washington, asks bids until June 22 for steel tanks, motor-operated pumping machinery, mechanical fan and piping for ethylizing systems at naval fleet air base, Coco Solo, Canal Zone (Specification 6620).

NEW ENGLAND

Standard Oil Co. of New York, New York, and 31 St. James Avenue, Boston, has awarded general contract to Coleman Brothers, Inc., 245 State Street, Boston, for oil storage and distributing plant at Quincy, Mass. Cost about $900,000 with equipment.

Department of Mental Diseases, Commonwealth of Massachusetts, State House, Boston, has awarded general contract to Proffit & White Construction Co., Fitchburg, Mass., for new steam power plant, 66 x 74 ft., at State colony, Gardner, Mass., for central heating service. Cost about $150,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until June 21 for one motor-driven screw-cutting lathe and spare parts (Schedule 8193) for Portsmouth, N. H., Navy Yard.

Kramer Iron Works, Inc., 81 York Street, New Haven, Conn., has been organized by Morris Kramer, New Haven, and associates, to manufacture iron and steel products.

United-Carr Fastener Co., 31 Ames Street, Cambridge, Mass., manufacturer of snap fasteners and kindred metal goods, has arranged with Dudley Lock Corpn., Chicago, for production of its products, including locks, padlocks, etc., in Canada, and will arrange for output at plant at Hamilton, Ont., where additional equipment will be installed.

Eagle Belt Lacer Co., Stratford, Conn., has been organized by F. G. Kall, 1261 Stratford Avenue, Stratford, and Henry Calhoun, 291 Grovers Avenue, Bridgeport, Conn., to manufacture metal belt lacers and kindred metal goods.

Lee Marble Works, Lee, Mass., will rebuild plant recently destroyed by fire. Conveying equipment will be required.

CENTRAL DISTRICT

Brier Hill Coal Co., Kittanning Road, Butler, Pa., plans rebuilding part of coal tipple near Butler, recently damaged by fire. Loss about $25,000.

Homestead Electric & Machine Co., Homestead, Pa., has been organized by John Laird, 1601 Andrew Street, Munhall, Pa., and Howard C. Jackson, 610 Doyle Avenue, West Homestead, Pa., to manufacture electrical and mechanical equipment, parts, etc.

American Austin Car Co., Butler, Pa., is arranging for resumption of production at automobile plant, following shut-down for several weeks. About 125 workers will be reinstated.

Board of Education, Veach Building, Oil City, Pa., plans manual training department in new four-story and basement high school, for which general contract has been let to L. O. Bouquin Co., Traymore Building. Cost about $230,000. W. H. Crosby, Beers Building, is architect.

Jackson Iron & Steel Co., Jackson, Ohio, has resumed production in all departments, following curtailment since February. Employment will be given to about 150 men.

City Council, Piqua, Ohio, has authorized erection of new municipal electric light and power plant, for which bond issue of $700,000 is available. Orders have been placed for part of equipment, other contracts will be placed in July. Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., is consulting engineer.

A-A Body & Radiator, Inc., Toledo, Ohio, has been organized by E. M. Mowery and A. C. Ehrenfried, care of Wolfe & Rogers, 1328 Nicholas Building, to manufacture automobile radiators, fenders and kindred products.

Mansfield Tire & Rubber Co., Mansfield, Ohio, has adopted a capacity schedule in all departments, operating on three 8-hr. shifts a day, with working quota of over 1100 men.

Metal Specialty Co., 1533 Riverside Drive, Cincinnati, has taken bids for new two-story plant, 140 x 232 ft., with extension, 37 x 88 ft. Cost over $150,000 with machinery. Tietig & Lee, 34 West Sixth Street, are architects.

Alpha Portland Cement Co., Ironton, Ohio, has resumed operations at local mill, following curtailment for several weeks. Employment will be given to about 200 men.

Strong Mfg. Co., Sebring, Ohio, recently organized to manufacture enameled iron specialties, has started operations at local plant, formerly property of company of same name, and will soon expand production. W. U. Pfaeffli is president.

Department of Public Welfare, Ninth and Oak Streets, Columbus, Ohio, John McSweeney, director, asks bids until June 20 for combustion control and metering equipment for Ohio State Penitentiary. C. E. Morrow, consulting engineer, Division of Engineering, Ohio-Hartman Building, Columbus.

Crosley Radio Broadcasting Studios, 1329 Arlington Street, Cincinnati, an interest of Crosley Radio Corpn., same address, has secured permission for large broadcasting station at Mason, Ohio, to include steel towers, antenna, power and generating station and other units. Cost over $500,000 with equipment.

Owens-Illinois Glass Co., 965 Wall Street, Toledo, Ohio, has adopted four-shift 6-hr. day at all plants in different parts of country, adding 2000 men, bringing total working quota to normal basis of 8000 men.

City Council, Veedersburg, Ind., is considering erection of a municipal electric light and power plant. John W. Moore & Son, Indiana Pythian Building, Indianapolis, are consulting engineers.

City Council, Marion, Ind., plans early call for bids for two centrifugal pumping units, with accessories, for municipal water supply. John W. Moore & Son, Indiana Pythian Building, Indianapolis, are consulting engineers.

Noblitt-Sparks Industries, Inc., 603 East Washington Street, Indianapolis, manufacturer of sheet tubing, stampings and other metal products, is advancing production and number of departments are now on 24-hr. day basis, seven-day week.

Sedan Body Co., Union City, Ind., has been reorganized under same name with capital of $300,000 to take over and expand local plant manufacturing automobile bodies.

Kohler Aviation Co., Grand Rapids, Mich., has plans for four new hangar units and one-story repair and reconditioning shop at local airport. Cost over $75,000 with equipment.

Date Indicator Co., Inc., Detroit, has been organized by O. Adelman, 9380 Broad Street, and associates to manufacture date indicators and other metal office specialties.

Cadillac Can Co., Mount Clemens, Mich., manufacturer of tin containers, recently removed from Cincinnati, has begun production and soon will develop capacity output.

Michigan Boiler & Sheet Iron Works, Inc., Detroit, has been organized by Frank Wimmer and associates, to take over and succeed to company of same name with plant at 4120 West Jefferson Street.

Standard Oil Co. of Indiana, 910 South Michigan Avenue, Chicago, plans extensions in bulk oil storage and distributing plant at Bay City, Mich., including installation of 40,000-bbl. tank unit.

Norge Corpn., Muskegon, Mich., manufacturer of electric refrigerators, a division of Borg-Warner Corpn., Chicago, has advanced production and is now giving employment to about 1300 persons, or about double working force for corresponding period a year ago.

Clouse Machine Products Co., Indianapolis, has taken over part of plant of Marmon Motor Car Co. for manufacture of tools and other machine products.

SOUTH CENTRAL

Board of City Commissioners, Gulfport, Miss., arranging fund of $30,000 for first unit of freight storage and distributing building on east pier, to include installation of loading, conveying and other mechanical-handling equipment.

Pan-American Petroleum & Transport Co., Memphis, Tenn., let contract to Consolidated Contractors, Inc., 843 Vance Avenue, for new unloading dock for oil handling and distribution. Headquarters are at 122 East Forty-second Street, New York.

Nixon-Hasselle Co., Carter and Thirteenth Streets, Chattanooga, Tenn., is planning purchase of a motor-driven mine hoist, about 250 hp. capacity, and 12 x 36 in., and 12 x 24-in. jaw crushers.

All-Steel Hoe Co., Bogalusa, La., recently organized by R. L. Bonney and H. B. White, has leased part of factory of Bogalusa Furniture Co. for plant for manufacture of steel farm implements.

MIDDLE WEST

United States Engineer Office, 333 North Michigan Avenue, Chicago, asks bids until June 22 for three vertical irrigation pumps for Goose Lake pumping station, Grundy County, Ill. (Circular 150).

City Council, Hillsboro, Ill., has surveys under way for a municipal electric light and power plant. Cost about $200,000 with equipment. Bond issue is being arranged. Warren & VanPragg, Decatur, Ill., are consulting engineers.

Blackstone Mfg. Co., Chicago, has been organized by Carl M. Halperin and others to take over and expand company of same name at 1430 South Michigan Avenue, manufacturer of automobile lamps and kindred electrical products.

Signal Corp., Procurement District, Chicago, asks bids until June 21 for 1400 disconnectors, 300 to 900 headsets and other equipment (Circular 63).

Maytag Co., Newton, Iowa, manufacturer of electric washing machines, parts, etc., has resumed production in all departments, following curtailment for several weeks. About 1100 men have been reinstated.

Valley Iron Works, Inc., St. Paul, Minn., has been organized, capital $50,000, to take over and expand company of same name with foundry at 81 East Water Street, specializing in production of gray iron castings. Incorporators include Stuart L. Cameron and Milton C. Lightner, both of St. Paul.

Chicago Electric Refrigerator Co., 157 North Michigan Avenue, Chicago, has been organized by John L. Ward and David H. Sokolow, to manufacture electric refrigerators and parts.

State Board of Education, State House, Des Moines, Iowa, has asked bids on general contract for five-story addition to hydraulic engineering laboratory building at State University, Iowa City. Cost over $50,000 with equipment. W. H. Gemmill is secretary of board.

Board of Water and Light Commissioners, 516 Chestnut Street, Virginia, Minn., asks bids until June 20 for soot blower equipment for power plant. F. W. Kline is secretary.

Oak Mfg. Co., 308 West Washington Street, Chicago, has been organized by J. G. Fitzgerald and R. J. Rooney, to manufacture mechanical parts and equipment.

Iowa Electric Co., Dows Building, Cedar Rapids, Iowa, plans construction of transmission lines in Jackson County.

Department of Public Works, Duluth, Minn., Emil Gustafson, commissioner, plans installation of pumping machinery and other power equipment in new chlorination plant at municipal waterworks. Cost about $200,000. John Wilson is city engineer.

Hanfords, Inc., 500 Pearl Street, Sioux City, Iowa, has taken out permit for bulk oil storage and distributing plant. Cost about $35,000 with equipment.

Chicago Malleable Castings Co., Railway Exchange Building, Chicago, has purchased from McCord Mfg. Co., Chicago, all equipment and manufacturing and selling rights for McCord journal box and lid.

Goss Printing Press Co., 1535 South Paulina Street, Chicago, states that a recent item to the effect that it is contemplating removal of its plant to Holland, Mich., is incorrect.

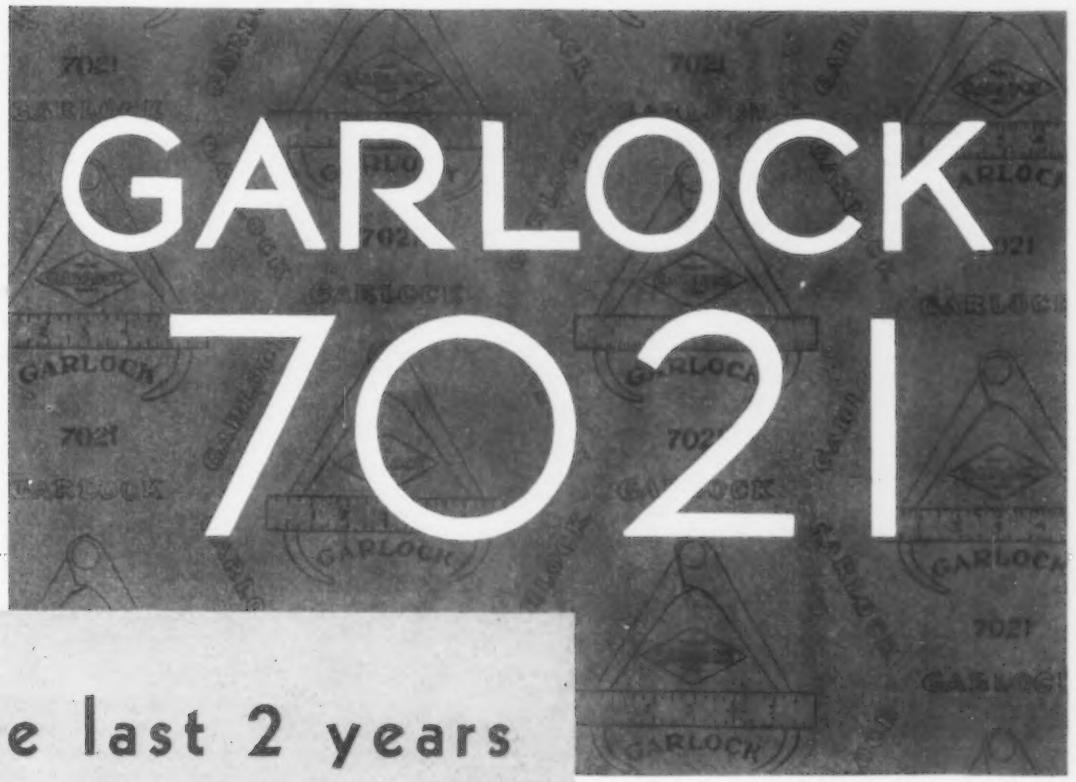
Village Board, Kohler, Wis., has engaged Jerry Donohue Engineering Co., Sheboygan, Wis., to prepare plans for municipal garbage disposal plant, sewage disposal plant and extension and improvement of present sewerage system, at cost of $150,000. Bids will be taken about July 1. William Nesemann is village clerk.

Jefferson Sheet Metal Works, Jefferson, Wis., has been organized by J. C. Jackson and R. H. Eiden and is purchasing equipment for new shop.

Hasco Valve & Machine Co. 1819 West St. Paul Avenue, Milwaukee, which recently took over all manufacturing activities of B. Hoffmann Mfg. Co., same address, reports orders in considerable volume for stainless steel valves from Wisconsin paper and pulp mill industries. Concern also is manufacturing electrically operated valves for radio control destroyers for United States Navy.

Milwaukee Branch, Ford Motor Co., has increased working force to 860 men and will step up production schedule by July 1 from present rate of 108 units daily to 200, employing about 1000 men.

Chicago & Northwestern Railway Co., has closed its Chicago locomotive and car shops for an indefinite period. About 1000 men have been laid off. Locomotive shop was reopened



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For gaskets on pipe lines and other equipment handling gasoline, oil, gas or steam at extreme temperatures and pressures, leading engineers, everywhere, are specifying Garlock 7021 Compressed Asbestos Sheet Packing. One trial will convince you —as it has hundreds of others—that Garlock 7021 is unequalled for severe service conditions.

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GARLOCK

in February and car department in March after having been closed for about four months.

SOUTHWEST

Board of Education, Library Building, Kansas City, Mo., George C. Tinker, secretary, plans manual training department in new three and four-story and basement Lincoln high school for colored students and will take bids soon on general contract. Cost about $600,000. Charles A. Smith, Finance Building, is architect; Nate W. Downes, Finance Building, is mechanical engineer.

Acmedor Mfg. Co., North Kansas City, Mo., has been organized by Luther S. Swearingen, R.F.D. No. 3, Kansas City, Kan., and associates, to manufacture fireproof doors and kindred products.

Construction Service, Veterans' Administration, Arlington Building, Washington, asks bids until June 21 for new veterans' institutional buildings at Fayetteville, Ark., including boiler plant, one-story shop building, steel water tank and tower, refrigerating and ice-making plant, transformer station and other units. Entire project will cost about $1,000,000.

Board of Water Commissioners, Fort Smith, Ark., is considering a fund of $131,000 for extensions and improvements in municipal waterworks, including installation of pumping machinery and other mechanical equipment.

Marland Oil Co. of Oklahoma, Inc., Ponca City, Okla., recently organized by E. W. Marland, Ponca City, and associates, capital $1,000,000, is planning purchase of oil properties in Oklahoma and Kansas, and will establish producing wells, refineries, oil storage and distributing plants, pipe lines, etc. Mr. Marland is president; J. S. Alcorn is vice-president.

Safe-Quick Products Corpn., Kansas City, Mo., has been organized by Samuel W. Ramsel, 716 Gleed Terrace, and associates, to manufacture washing machines and parts.

Kewanee Oil & Gas Co., Robinson, Ill., has purchased about 185 acres in Gregg County, east Texas oilfields, and plans development, with installation of oil drilling equipment, storage facilities, etc.

Quartermaster, Fort Riley, Kan., asks bids until June 27 for pipe-threading tools, wire rope, tinners' supplies, transformers, galvanized iron, steam boilers, gas burners, paving breakers, wire fencing, gas water heaters, electrical supplies, switches, storage tanks, tools, and other equipment and supplies (Circular 68).

Marathon Oil Co., Fort Worth, Tex., affiliated with Ohio Oil Co., Findlay, Ohio, plans expansion and improvements at local refinery, including installation of new machinery, with cracking equipment, etc. Cost close to $1,000,000.

PACIFIC COAST

Los Angeles Fertilizer Co., 2543 East Twenty-fifth Street, Los Angeles, has plans for two-story addition, 69 x 89 ft., including metal tanks, hoppers, mixing tower and other equipment. Cost about $25,000 complete. C. F. Tyrrell, 1200 North Main Street, is architect.

Shell Oil Co., 200 Bush Street, San Francisco, is arranging fund of about $1,000,000 for extensions and improvements in different coast cities, including erection of new units. Compay is affiliated with Shell Union Oil Corpn., New York. Shell Oil Co. of British Columbia, Vancouver, B. C., a Canadian interest, is planning new oil refinery on 80-acre tract near Vancouver, including storage and distributing plant. Cost about $1,000,000 with machinery.

Bureau of Supplies and Accounts, Navy Department, Washington, asks Bids until June 28 for three motor-driven capstans and spare parts for Puget Sound Navy Yard (Schedule 8191); until June 21 for 15 paint sprayer outfits for Mare Island Navy Yard (Schedule 8153).

Columbia Concrete Pipe Co., Wenatchee, Wash., manufacturer of reinforced concrete pipe, has plans for new one story plant. Company will remove certain equipment from former plant of W. P. Hews, head of Columbia company, at Yakima, Wash., increasing capacity. Cost about $25,000.

Constructing Quartermaster, 829 Fourth Street, San Rafael, Cal., asks bids until June 20 for buildings for Marin Meadows bombing base, Hamilton Field, Marin County, including machine shop, 111 x 200 ft., cost $100,000; hangar, 111 x 200 ft., with parachute section and shop facilities, cost $160,000; radio building, cost $25,000, and other structures; also for underground electrical distributing system, oil and gas distributing system with tanks, pumps and other equipment. Total cost about $1,000,000.

Ford Motor Co. has opened new assembling plant at Seattle, with initial working force of 600 men. This quota will be stepped-up at early date. Plant was recently completed at cost of over $2,000,000.

Walter T. Varney, president, Varney Air Lines, Los Angeles, has secured permission to acquire plant and property of Lockheed Aircraft Co., West San Fernando Boulevard, Burbank, Cal., in receivership, for price of $40,000. New owner plans to reorganize company and will continue aircraft manufacturing works, expanding production facilities.

Constructing Quartermaster, March Field, Cal., asks bids until June 25 for gasoline storage tanks, control equipment, fill and delivery lines; until June 20 for gas distributing mains and laterals, and water distributing system.

CANADA

Labelle, Nickel & Garnet Co., Ltd., 354 St. Catharine Street East, Montreal, plans to start work immediately on the erection of a refinery at Ville Lasalle, Que., to cost $150,000. J. J. Crawford is designing engineer. Machinery arrangements are being made by Machinery Equipment & Supply Co., Ltd., 1092 Panel Street, Montreal.

Shell Oil Co. of Canada, Ltd., 21 Dundas Square, Toronto, will build a $2,000,000 oil refinery at Montreal East, Que. P. Reynolds is engineer.

Lennox Furnace Co., Syracuse, has sold controlling interest in Lennox Furnace Co. of Canada, Ltd., to a group of men headed by L. L. Anthes of the Anthes Foundry Co., 64 Jefferson Avenue, Toronto. It is understood that a plant at St. Catharines, Ont., will be equipped to manufacture Lennox furnaces for distribution in Canada.

Sorel Steel Foundries, Ltd., Sorel, Que., has plans for an addition. New equipment will be required.

Labelle Construction Co., Ville Lasalle, Que., is being organized and will establish a granite plant to cost $150,000. Joseph Gadoury, 151 St. James Street, is interested.

Canadian Industries, Ltd., has completed its new cellophane plant at Shawinigan Falls, Que., and will start production at once. This mill, which was built and equipped at a cost of $1,000,000, is fourth to be established by company in Canada in past two years. Associated with Canadian concern are Du Pont de Nemours Co. of United States and Imperial Chemical Industries of Great Britain.

American Brass Co., Waterbury, Conn., will operate in full by July 1 its new tube mill at Toronto, according to company's officers. This mill, which will employ 75 to 100 men, will have a monthly production of about 300,000 lb. of copper and brass tubing, ranging from ¼-in. outside diameter to 5-in. inside diameter.

FOREIGN

Stewarts & Lloyds, Ltd., Old Hill, Staffordshire, England, operating Lion Tube Works and Coombs Tube Works, latter at Halesowen, and United Steel Co., Ltd., Workington, Cumberland, England, operating Moss Bay Iron Works, Derwent Iron Works, Lowther Iron Works and other properties, are planning joint construction of new steel works to operate under Bessemer process. Site is being selected. Cost over £3,500,000 (about $12,845,000).

Fricker's Metal & Chemical Co., Ltd., Norfolk House, Laurence Pountney Hill, London, England, recently organized with capital of £300,000 (about $1,101,000), will take over and expand Fricker's Metal Co., Ltd., London., now in liquidation. New company will be associated with Imperial Smelting Corpn., Ltd., London, for production of zinc, lead and other metals and will operate smelters, galvanizing plants and other refining units.

Business Changes

Rechter Transmission Co., Inc., mill supplies and power transmission, recently organized, has leased office space at 321 Broadway, New York.

Greer Steel Co., Dover, Ohio, manufacturer of cold-rolled strip steel, has appointed Hubbell & Sharp, 2817 Laclede Avenue, St. Louis, as district representatives.

Poole Foundry & Machine Co., Baltimore, manufacturer of flexible coupling, has appointed Ladd Equipment Co., First National Bank Building, Pittsburgh, as district representatives in western Pennsylvania, West Virginia and eastern Ohio.

Trade Notes

International-Stacey Corpn., Columbus, Ohio, announces that its financial affairs have been completely adjusted and placed upon a more secure foundation. Under the reorganization the following officers have been elected: Carmi A. Thompson, chairman of the board; L. J. Brown, president and general manager; R. R. Bloss, vice-president; C. G. Runkle, vice-president; B. S. Wellman, secretary; Carmi A. Thompson, treasurer; R. B. McCleery, assistant secretary and assistant treasurer.

* * *

Pittsburgh 'Lectromelt Furnace Corpn., Pittsburgh, has installed a 1½-ton electric furnace in the McKees Rocks, Pa., plant of the Pressed Steel Car Co. It is being used for producing steel, gray iron and malleable castings to meet the need for small heats under reduced operating schedules.

* * *

Driver-Harris Co., Harrison, N. J., has been licensed by the International Nickel Co. to melt and fabricate the corrosion-resisting alloy, Ni-Resist, a nickel-copper-chromium cast iron containing approximately 14 per cent nickel, 6 per cent copper and 2 per cent chromium, the remainder cast iron.

* * *

Bailey meter automatic control for open-hearth furnaces will feature a display of the Bailey Meter Co., Cleveland, at the iron and steel exhibition to be held at the William Penn Hotel, Pittsburgh, June 20 to 23. Diagrams will show how the furnace draft is maintained within narrow limits and the fuel-air ratio is regulated for high combustion economy. H. M. Hammond, manager of sales and engineering, will be in charge.

* * *

National Alliance of Art and Industry will hold its first national exhibition of three-dimensional objects produced by industry at the Art Center Building, 65 East Fifty-sixth Street, New York, June 20 to Oct. 1. The exhibit will present a complete and comprehensive view of the accomplishments of contemporary American design for the machine.

* * *

Deep Sea Export & Import Co., Inc., 73 Pearl Street, New York, manufacturers' representative and exporter, has been organized to handle the business formerly conducted by Arkell & Douglas, Inc., which is in liquidation.

* * *

Navigation will be opened on the lower Missouri River between St. Louis and Kansas City on June 21. The project has cost approximately $6,000,000. Regular barge line service will not be started until Army engineers certify a constant 6-ft. channel.

COAL DEPOSITS ARE MANY

FATHER HENNEPIN, French Jesuit missionary explorer, is credited with the first discovery of coal in what is now the United States. ... In 1679 he found indications of coal on the banks of the Illinois River and noted in his diary that there was a "cole mine" above Fort Crevecoeur, near the present city of Ottawa, Illinois. ... We find recorded the discovery of coal in Virginia in 1701 and in Ohio in 1755. George Washington told in his journal of inspecting a coal mine on the banks of the Ohio in 1770. Coal has been found in 31 of the present 48 states. ... Original coal resources of the United States are placed by the United States Geological Survey at 3,214,898,600,000 tons, of which 26,865,823,000 had been mined to the end of 1931. ... Early attempts to smelt iron with coal failed, but the need for fuel other than charcoal grew pressing and in 1836 anthracite coal was successfully used in smelting, remaining in use until coke replaced it.

Interlake Iron Corporation has extensive resources of high grade coals for metallurgical and other uses through ownership in the Kingston-Pocahontas Coal Co., whose West Virginia mines have reserves of 108,000,000 tons; in the Black Mountain property with 30,000 acres of coal land in Kentucky and Virginia; and in the Mather Collieries, with a large mine in Greene County, Pa.

INTERLAKE IRON CORPORATION

PIG IRON ... COKE

PICKANDS, MATHER & COMPANY, Sales Agents

CLEVELAND ... CHICAGO ... DETROIT ... ERIE

A Comparative Cost System for the Steel Industry

(*Concluded from page* 1286)

methods should be watched closely and the daily total ideal cost for supplies and service changed accordingly. Any improvement in actual practice that reduces this total daily cost should be credited to the superintendent. This item per ton is directly reduced by increased daily pig iron production.

The cost of overhead includes all those items usually carried under "general operating expense" and "miscellaneous operating expense" in the regular pig iron cost sheet, excepting the charges for relining and for depreciation. It includes salaries, taxes (whenever taxes are shown in the regular cost sheet — notation should be made when not so included), insurance, fees, office expense, hospital and first aid, laboratory, demurrage, telephone and telegraph, watchmen and police, automobiles and teams.

Relining and Depreciation

The relining charges are fixed at so much per ton and should be shown separately from depreciation charges, which may be either so much per ton regardless of tonnage, or so much per month and varying directly with the tonnage. Even if depreciation charges are not usually included in the regular cost sheet it is almost necessary to include them in comparing the pig iron costs at different plants.

A per-ton charge for obsolesence is sadly lacking in present steel plant cost sheets, but probably will soon be recognized by governmental accountants as well as by steel plant executives.

Collecting the Data

In order to facilitate the work of comparing the actual cost of pig iron with the ideal cost according to the methods of the comparative cost system, use is made of "Cost Data Sheet No. 1" and "Cost Data Sheet No. 2," forms of which are herewith shown. From all these data the final comparative cost sheet is made up. To facilitate the work of getting monthly averages of analyses and conditions, forms, such as are ordinarily used for keeping furnace data, are made a part of the comparative cost system for pig iron.

An excellent feature of this comparative cost system is that it in no way upsets or changes the regular cost accounting system; neither does it add complications in the distribution of items of cost; it segregates irregularities and focuses attention of executive and operator to the spots that need correction.

The responsibility for the capacity and cost of the blast furnace and its equipment rests with the management; the superintendent is responsible for the maintenance and repairs. The responsibility for the quality and the price of ore, coke and limestone rests directly upon the management; the responsibility of the superintendent is limited by these prices and by the analyses of the raw materials.

The function of the comparative cost system for pig iron is two-fold: It guides the management in obtaining the most economical combinations of ore, coke, and limestone, and it guides the superintendent in producing the greatest possible tonnage of pig iron with the least possible cost from the raw materials furnished by the management. The fairness of this comparative system commends itself to both the management and the operating superintendent.

The actual cost each month is compared with the ideal (100 per cent perfect) cost for that particular month and under the conditions of prices and analyses of raw materials that prevailed during that month. Such a comparison is a measuring-stick for the ability of the management and the skill of the superintendent; it is a "bogey" to be beaten.

(To be concluded)

Machinery Exports Declined in April, Imports Also Lower

WASHINGTON, June 10.—The downward trend of machinery exports was continued in April, when they aggregated $12,233,000, a drop of $1,262,000 under those of March. Foreign shipments of industrial machinery, as classified by the Division of Statistics, were valued at $5,191,000 as against $5,505,000.

Imports of machinery declined to $641,464, a decrease of $50,000.

Imports of Machinery Into the United States

(By Value)

	April		Four Months Ended April	
	1932	1931	1932	1931
Metal-working machine tools	$8,655	$12,597	$71,881	$84,923
Agricultural machinery and implements	98,073	252,574	383,832	2,024,062
Electrical machinery and apparatus	190,065	214,472	613,855	784,657
Other power-generating machinery	13,387	19,370	100,518	96,482
Other machinery	283,741	474,194	1,121,664	1,593,223
Automobiles and other vehicles, except agricultural	47,543	116,610	232,925	416,357
Total	$641,464	$1,089,817	$2,524,675	$4,999,704

Machinery Exports

(By Value in Thousands of Dollars)

	April		Four Months Ended April	
	1932	1931	1932	1931
Locomotives	....	$30	$107	$54
Other steam engines	81	2	260	86
Boilers	1	15	27	126
Accessories and parts	10	36	90	202
Automobile engines	281	400	919	1,181
Other internal combustion engines	170	343	547	1,548
Accessories and parts for	93	278	451	870
Electric locomotives	12	95	44	232
Other electric machinery and apparatus	28	278	961	1,694
Excavating machinery	66	501	478	1,199
Concrete mixers	3	21	24	113
Road-making machinery	19	140	93	461
Elevators and elevator machinery	66	295	340	1,153
Mining and quarrying machinery	279	350	1,357	2,010
Oil well machinery	190	1,081	1,047	5,123
Pumps	163	366	653	1,722
Bending and power presses	244	193	397	1,369
Forging machinery	71	465	433	1,437
Machine tools	671	1,805	2,483	9,261
Other metal-working machinery and parts of	198	343	820	1,347
Textile machinery	365	594	1,822	2,324
Sewing machines	462	324	1,606	1,503
Shoe machinery	59	105	239	380
Flour-mill and gristmi'l machinery	6	50	36	130
Sugar-mill machinery	82	73	210	340
Paper and pulp mill machinery	57	146	208	513
Sawmill machinery	15	63	104	200
Other woodworking machinery	16	115	79	397
Refrigerating and ice-making machinery	23	96	136	457
Air compressors	93	166	453	723
Typewriters	609	950	2,565	3,901
Power laundry machinery	20	103	107	361
Typesetting machines	94	233	343	858
Printing presses	135	326	479	846
Agricultural machinery and implements	862	6,346	4,010	45,490
A'l other machinery and parts	6,769	14,450	26,917	52,586
Total	$12,233	$31,077	$50,845	$142,197

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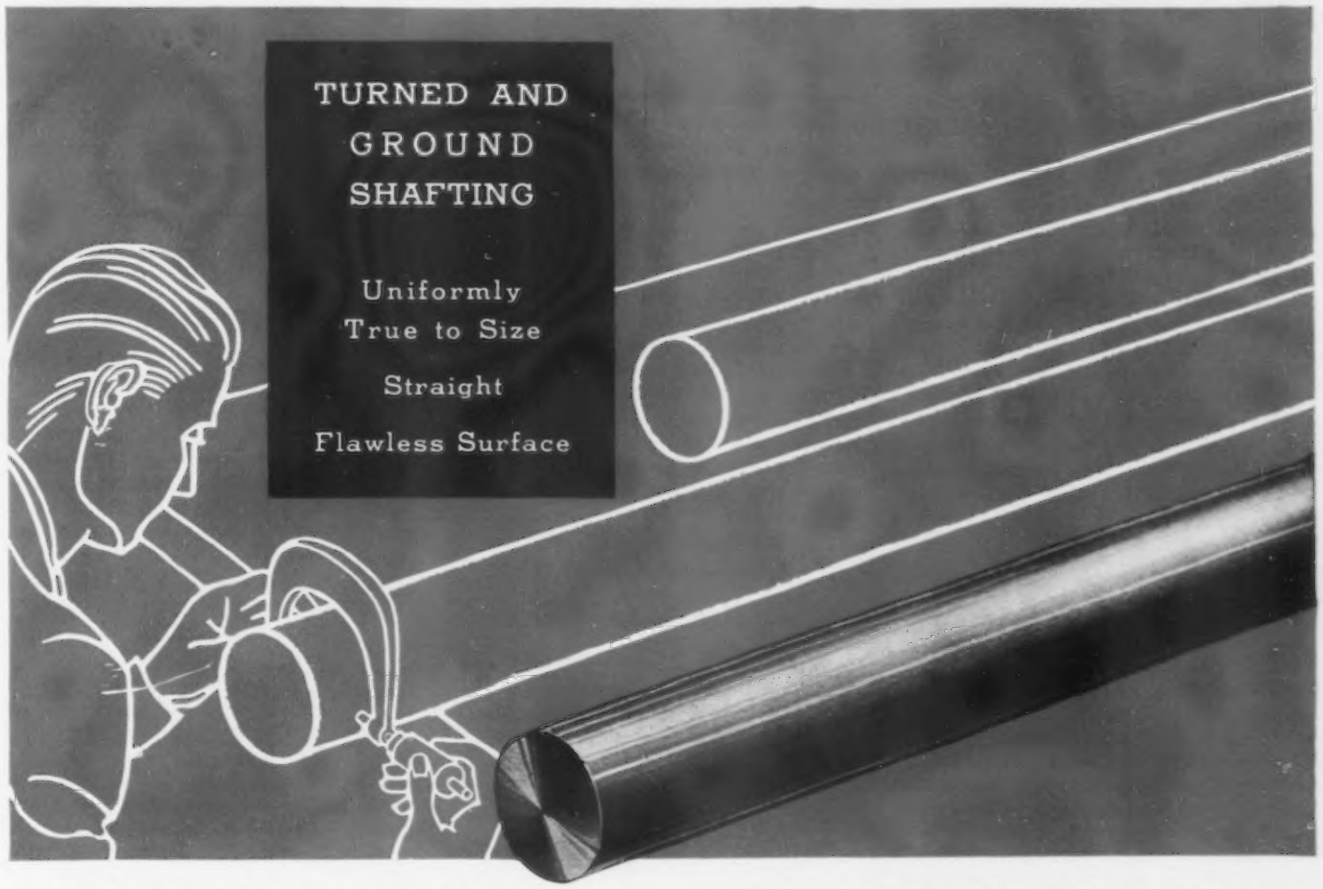

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The experience of 82 years of iron and steel making is reflected in the excellence of all J & L Cold Finished Steels. Uniformity of this high quality is maintained through J & L ownership-control of all raw materials and processes of manufacture from ore to finished product.

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Solving Problems Which Vex the Rustless Steel Industry

(*Concluded from page* 1284)

ly than the making of corresponding products in ordinary qualities.

High Cost Still a Handicap

Multiplying these basic handicaps with our still fragmentary knowledge, with lack of suitable equipment, of trained organizations and of satisfactory production volume, adding thereto the cost of educational and development work, one can readily discern the major causes for the existing high cost levels and at the same time visualize the possibilities of substantial improvements. Similarly, important opportunities present themselves in the fabricating field where heretofore faulty practices and misapplication have often exacted a heavy toll from producers as well as users of rustless steels.

With no desire to appear critical toward any of these factors and with full appreciation of important contributions made to rustless steel progress by science and industry in a relatively short space of time, this writer ventures the prediction that, through real merit and economic worth, spurred on by competition and demand, these steels will make rapid strides toward their rightful place in industry for the good of man and with honor to the art.

Discussion by V. B. Browne
Vice-President, Allegheny Steel Co., Brackenridge, Pa.

THE author is to be commended for his frank discussion of the operating problems encountered in the production of high-grade rustless steel products. It is hoped that the consumer will get an opportunity to read this paper. Perhaps after reading it he will recognize that the price which he is paying for these alloys is really justified by the cost of production.

Our alloy scrap piles are indeed sad commentaries on the inexperience of heaters and melters. A heat of stainless steel breaks up during the rolling and is scrapped. The heater and melter get into a heated argument over the responsibility, abusing each other in terms which are emphatic, but not parliamentary. The tension is finally relieved by the happy suggestion "we will ask the metallurgist about this."

Pity the poor metallurgist! He is shown a corpse and is asked to diagnose the disease that caused the unfortunate demise. Usually he looks wise and talks glibly about gamma iron, delta iron, liquid phase, and what have you. This duly impresses both the heater and melter, but fails to satisfy either one of them. It is a ten to one shot that if he would say to the heater, "Frank, you know darned well you burned this heat," or if he would say to the melter, "Bill, why in hell did you tap a wild heat," either one would 'fess up and try to do better next time. Bill and Frank are conscientious chaps who have a tremendous enthusiasm for these alloys, and recognize that without the aid of the metallurgist they would be sunk. It pays to speak their language in order to inspire their confidence and cooperation.

Mr. Smith has presented the technique of the rolling and handling of these alloys in an able manner and has shown that well-made alloy ingots can easily be spoiled in subsequent operations—a fact not generally admitted.

Melting Scrap in Ring Induction Furnace

It is evident that the author's experience with the induction furnace has been confined to melting the 18-8 alloy which, except under certain unusual conditions, is the least susceptible of all the stainless group to gas absorption. I have been intimately associated with the operation of two of these furnaces for the last nine years. Incidentally, these two furnaces are exact duplicates of the one described by the author, and for his information I might mention that one of these furnaces has been in continuous operation since November, 1923. I agree that this type of furnace is an excellent tool and a splendid adjunct to any melting shop, but I do not think it has the flexibility of the arc. It's most ardent supporter will concede this.

Under suitable technical control the arc furnace will utilize all its stainless scrap even though we assume a scrap yield of 50 per cent from ingot weight to fabricated articles. Eighteen-eight with a maximum carbon content of 0.07 per cent can be produced in the arc using a fairly high percentage of scrap in the charge, and to consistently maintain a carbon content under 0.12 per cent is no trick at all. Of course, scrap contaminated with oil and other carbonaceous material, which is returned from the consumer, cannot be utilized in any type of furnace except by heroic methods of questionable economy. It is more expedient to use this type of scrap in the production of lower types of alloys with a less restricted chemical composition.

Intermittent operation, due to peaks and depressions in sales continuity, will cause an accumulation or depletion of scrap, but this will be remedied when the average consumption can be anticipated with sufficient accuracy to permit the producer to carry a reasonable inventory of ingots, and thereby stabilize his production.

Plate Fabrication Orders Higher in April

WASHINGTON, June 9.—Rising 1632 tons, orders for fabricated steel plate in April totaled 14,196 tons, against 12,564 in March, according to reports received by the Bureau of the Census from 51 identical manufacturers. April orders in tons were distributed as follows: Oil storage tanks, 1400; refinery materials and equipment, 604; tank cars, 157; gas holders, 710; blast furnaces, 30; miscellaneous, 11,295.

I.C.C. Cancels Proposed Lower Coal Rates

WASHINGTON, June 11.—The Interstate Commerce Commission has ordered cancellation of schedules filed by the Wheeling & Lake Erie Railroad proposing reduced rates on ex-river bituminous coal from points on the Ohio River of 95c. to Canton and Massillon, and $1.10 to Cleveland, Lorain and South Lorain, Ohio. The commission, however, made its decision without prejudice to the filing of rates of $1.02 and $1.27, respectively. The Otis Steel Co. and the Corrigan, McKinney Steel Co., Cleveland, had supported the railroad's request for establishment of the proposed rates. The coal involved in the proposed hauls would come from mines on the Monongahela, Allegheny and Ohio Rivers.

Steel Barrel Output

WASHINGTON, June 10.—Production of steel barrels in April declined to 445,819 units from 448,148 in March, according to reports received by the Bureau of the Census from 27 establishments. Stocks declined to 34,310 from 40,360 and unfilled orders dropped to 1,030,639 from 1,138,886.

Steel Castings Orders

WASHINGTON, June 10.—Orders for commercial steel castings totaled 12,807 tons in April, against 16,588 tons in March, according to reports received by the Bureau of the Census from 130 establishments. Production declined to 17,463 tons from 20,464 tons.